This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

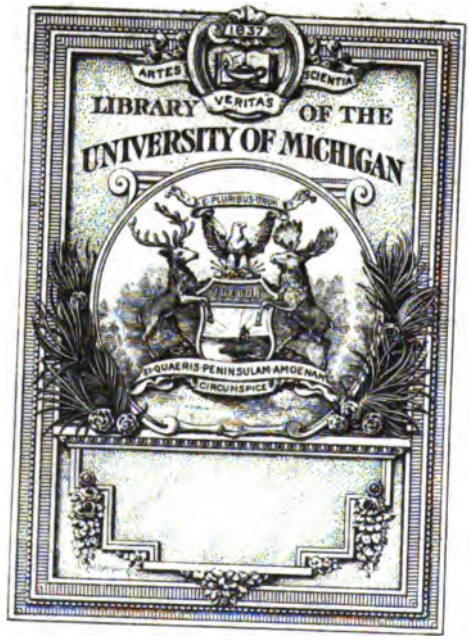
+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

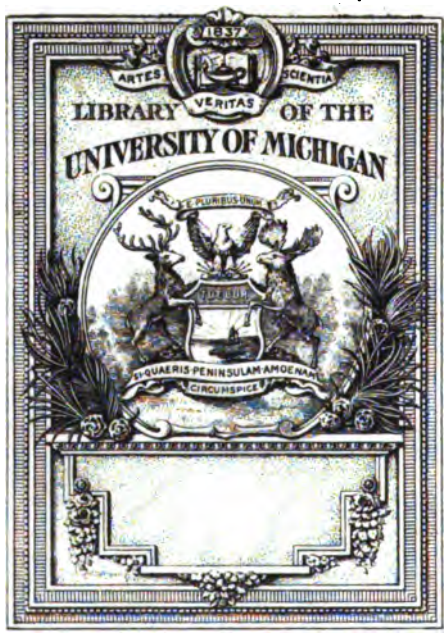
+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`


1837
ARTES
VERITAS
SCIENTIA
LIBRARY OF THE
UNIVERSITY OF MICHIGAN
E PLURIBUS UNUM
SI QUAERIS PENINSULAM AMOENAM
CIRCUMSPICE


1837
ARTES
VERITAS
SCIENTIA
LIBRARY OF THE
UNIVERSITY OF MICHIGAN
E PLURIBUS UNUM
SI QUAERIS PENINSULAM AMOENAM
CIRCUMSPICE

THE

SCIENCE

AND

96487

ART OF SURGERY,

OR THE

SEMEIOLOGY, PATHOLOGY, THERAPEUTICS AND OPERATIONS

OF

SURGERY,

BY

E. C. FRANKLIN, M. D.,

PROFESSOR OF SURGERY AND CLINICAL SURGERY IN THE HOMŒOPATHIC COLLEGE OF THE UNIVERSITY OF MICHIGAN; SURGEON TO THE UNIVERSITY HOMŒOPATHIC HOSPITAL; AUTHOR OF A COMPLETE TREATISE ON MINOR SURGERY; AUTHOR OF A MANUAL ON SPINAL CURVATIONS; MEMBER OF THE AMERICAN INSTITUTE OF HOMŒOPATHY, OF THE WESTERN ACADEMY OF HOMŒOPATHY, AND HONORARY MEMBER OF SEVERAL STATE SOCIETIES.

SECOND EDITION.

REVISED, ABRIDGED AND ILLUSTRATED.

ANN ARBOR:
S. C. ANDREWS, PUBLISHER,
1882.

Entered, according to Act of Congress, in the year 1883, by
E. C. FRANKLIN, M. D.,
In the office of the Librarian of Congress, at Washington, D. C.

TO

I. N. ELDRIDGE, M. D., AND A. I. SAWYER, M. D.,

MEMBERS OF THE "EXAMINING BOARD" OF THE

HOMOEOPATHIC COLLEGE, UNIVERSITY OF MICHIGAN,

AS A TRIBUTE TO THEIR LIFE-LONG DEVOTION TO

THE CAUSE OF HOMŒOPATHY IN THE STATE OF MICHIGAN,

AND THEIR UNTIRING ZEAL IN PROCURING ITS INSITION
INTO THE UNIVERSITY AS A COLLEGE OF MEDICINE,
AND AS AN EXPRESSION OF WARM PERSONAL
FRIENDSHIP, ENGENDERED BY MANY
YEARS OF SOCIAL AND PROFES-
SIONAL INTERCOURSE,

THIS WORK IS FAITHFULLY INSCRIBED.

BY THEIR FRIEND,

THE AUTHOR.

PREFACE TO THE SECOND EDITION.

In presenting to the Homœopathic profession the *second edition* of my work on the Science and Art of Surgery, heretofore comprised in two volumes, I have omitted all that portion of the first volume referring to the "Art of Bandaging, and other points of Minor Surgery," and with the addition of other valuable and interesting matter, I have prepared a complete treatise on "Minor Surgery" for the use of practitioners and medical students. That portion of the work referring to the Principles of Surgery has undergone considerable change; in fact, it has been entirely reconstructed in order to get the work into the compass of a single volume to meet the requirements of the profession. In order to do this, I have been compelled to present only the briefer and more practical characteristics of all the diseases pertaining to the Science of Surgery, to strip them of all ornate phraseology and to put them into a clear and concise garb. By these means I have been enabled to add much more additional and instructive material than is contained in Vol. I of my first edition, and to largely increase the field of Therapeutics, in order to make this branch of our subject superior, if possible, to any of our recent works on Surgery. Feeling confident that the profession will appreciate my efforts in this direction, in the present as in the past, and with the promise of continued improvements in the future, this edition is kindly committed to the profession.

UNIVERSITY OF MICHIGAN, 1882.

TABLE OF CONTENTS TO VOL. I.

CHAPTER I.

PAGE.

Inflammation—Various Theories—Stages of Inflammation—Attendant Phenomena—Classification of Inflammation—Microscopical Appearances—Termination and Effects—Ulceration and Mortification—Treatment—Acute, Chronic and Sympathetic Abscess—Treatment—Ulceration—Causes of—Healthy, Irritable, Indolent, Inflamed, Hemorrhagic, Varicose and Phagedenic Ulcers—Treatment—Mortification—Gangrene and Sphacelus—Causes—Treatment—Hospital Gangrene—Bed Sores—Septicæmia—Hectic Fever—Treatment... 9–32

CHAPTER II.

Effects of Heat and Cold—Burns and Scalds—Chilblains—Frost Bite—Furunculus—Anthrax or Carbuncle—Pathology and Treatment 33–38

CHAPTER III.

Arteritis—Periangioma—Atheroma—Calcareous Degeneration—Embolism—Hemorrhage—Arrest of—Torn and Wounded Artery—Venous and Capillary Hemorrhage—Hemorrhagic Diathesis—Special Indications for Treatment..... 38–43

CHAPTER IV.

Injuries of Soft Structures—Primary and Secondary Shock—Treatment—Special Wounds—Incised, Lacerated, Contused, Punctured, Poisoned—Hydrophobia and Dissecting Wounds—Gun-shot Wounds of the Chest—Abdomen—Amputation after Gun-shot—Equinia—Glanders and Farcy..... 43–54

CHAPTER V.

Venereal Diseases—Gonorrhœa—Urethritis—Balanitis—Posthitis—Cystitis—Ischuria—Phimosis—Paraphimosis—Herpes of the Glans—Hypertrophy of Prepuce—Condylomata—Horny Excrescences—Priapism—Gangrene of Penis—Fibroid Tumor of Penis—Chronic Orchitis—Cystic Sarcocele—Fungoid Growths of Testicle—Hypospadias and Epispadias 55–70

CHAPTER VI.

Stricture of the Urethra—Spasmodic, inflammatory and Organic—Treatment—Internal and External Urethrotomy—Electrolysis—Retention of Urine—Extravasation of Urine—Urinary Abscess—Urine Fistula—Prostatitis—Senile Hypertrophy of the Prostate—Gonorrhœal Ophthalmia—Gonorrhœal Rheumatism—Gonorrhœa in women—Chancroid—Bubo—Mixed Chancre—Syphilis—Differentiation of Chancroid and Chancre—Urethral Chancre—Excision, Radical and Constitutional Taeatment—Constitutional Syphilis—Sympathetic Ulcerations and Ostitis—Infantile

Syphilis—Spermatorrhœa—Asperma—Marriage in Spermatorrhœa—Syphilitic Ostitis and Periostitis—Node—Alopecia—Onychia Syphilitica—Syphilitic Iritis, and Treatment..... 70–110

PART II.

CHAPTER I.

Tumors—Pathology—Origin—Benign, Malignant and Semi-malignant Tumors—Situation—Differentiation—Cystoma—Hygromata—Hydatids—Treatment—Ganglias—Proliferous Cysts—Cystosarcoma—Cysts in Bone—Sanguinious Cysts—Congenital Cutaneous Cysts—Mucous Cysts—Colloid Cysts—Adenoma—Lipoma Angionoma—Capillary Hypertrophy—Moles—Osteoma—Exostosis—Spongy, Hard and Eburnated, Microscopical Observations—Treatment—Cystoma in Bone—Hydatids in bone—Osteo-Aneurisms—Malignant Bone Tumors—Osteo-Myeloid—Special Indications for Treatment—Differentiation of Innocent and Malignant Bone Tumors—Fibroma—Fibro-plastic—Fibro-cellular—Fibro-myoma—Fibro-myxoma—Fibro-neuroma—Fibro-neuroma Traumatica—Glioma—Enchondroma—Epithelioma—Papillomata—Warts—Horny Growths—Horns upon the nails—Clavi—Bunion—Keloid—Carcinoma—Scirrhus—Encephaloid and Colloid—Melanosis—Treatment. 110–157

PART III.

CHAPTER I.

Wounds of Nerves—Concussion of Nerves—Electricity—Operation of Nerve Stretching—Tooth Wounds—Treatment..... 157–161

CHAPTER II.

Tetanus—Symptoms—Treatment—Special Indications for remedies—Nerve Stretching—Warm Baths..... 161–166

CHAPTER III.

Injuries and Diseases of Veins—Thrombosis—Varicose Aneurism—Lesions of Veins—Hemorrhagic Diathesis—Treatment—Entrance of Air into Veins—Phlebitis... 166–173

CHAPTER IV.

Hypertrophy of Bone—Atrophy of Bone—Ostitis—Caries—Necrosis Exfoliation—Sequestrum—Special Indications—Periostitis—Acute and Chronic—Mollities Ossium—Rachitis—Spina Bifida—Treatment—Special Indications—Sub-cutaneous Osteotomy.... 173–182

CHAPTER I.

INFLAMMATION, AND THE DISEASES ARISING OUT OF THE INFLAMMATORY PROCESS.

DISEASES OF TISSUES.

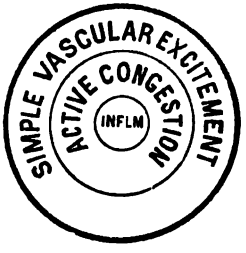
Inflammation.—*In*, in; *flamma*, a flame, is the parent of a large proportion of diseases to which the human family is liable. *Definition*—An alteration in the healthy structure and function of a part, accompanied by a perverted condition of the blood and capillary blood vessels, with vascular and cellular changes.

Various Theories.—Erasistratus taught, that, in inflammation, the arteries contained blood; in a normal condition they circulated air; the Humoralists next taught that the capillaries contained different kinds of bile and phlegm; the Methodists followed with their insensible corpuscles blocking up insensible pores; then followed the *anima*, or life-giving principle of Stahl which attributed inflammation to a condition of *spasm*. Since then, a series of theories followed. All *was* confusion and *is* at present. Holmes in his "System of Surgery" says, it *is* in the very crisis of revolution. Sanderson finds that stimuli applied locally cause an *increase of blood flow* and *dilatation of capillaries* (first stage of inflammation); others claim that the viscidity of the blood is the cause of crowding together of the blood globules in the inflamed parts, viz. 2d stage, thus reverting to the old theories. A few claim that the *inhibitory* or *vaso-motor* nerves produce capillary action and blood stasis, reviving the theory of spasm. Later pathologists advocate the "*coagulable lymph theory*" which is supposed to contain all the formative elements; molecules aggregate and form nucleoli in the blastema which arrange themselves into nuclei. A cell-wall there forms, thus constituting rudimentary elements, which ultimately form the various tissues. Then follows the *cellular pathology* advocated by Goodsir, Redfern and Virchow, which is called by Sir James Paget *the local*

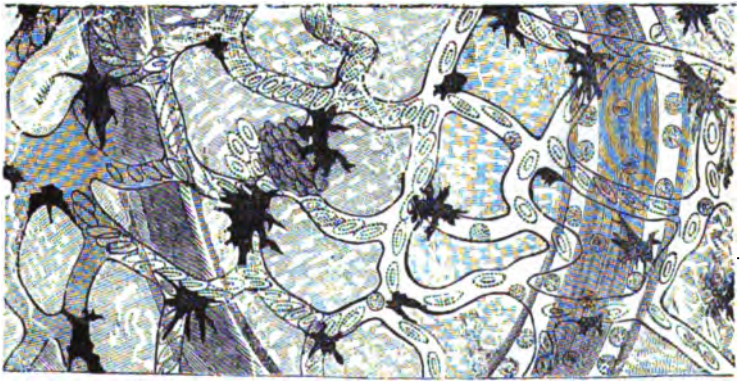
production theory. Recklinghausen discovers a moving corpuscle among the connective tissue-cells and sees it wandering hither and thither with stretched and retracting arms, passing into and without the vessels, *the migration theory;* Williams, Stricker, and Billroth call it the "*ameboid theory.*" These cells are called "leucocytes." Lionel Beale proclaims the *germinal theory* in which he states, invisible particles in the blood escape from the vessels *without* a rupture of their coats, and that the agents for the new formations are developed by their proliferation and subdivision. The *migration theory* is received at present as the correct one; this no doubt will be succeeded by others and the theory of inflammation will still remain in as much doubt and confusion as with the older writers.

Definition of Inhibitory Nerve or Vaso-Motor.—In case of injury to any part of the body, the centripetal, or *afferent* nerves convey the impression to the cerebro-spinal axis, and by the vaso-motor center is reflected through the centrifugal, or *efferent* nerves to the vessels which produce the blood changes.

Stages of Inflammation are three: 1st, *Vascular excitement;* 2d, *active congestion;* and 3d, *true inflammation.* First, spasm has taken place, succeeded by debility; then *vascular excitement* begins, with a determination of blood to the part; capillaries previously convening single files of red corpuscles, now admit them flowing through in masses and continually crowding onward; capillaries are dilated; invisible vessels become visible; functional activity increased; nutrition exalted; hyperæsthesia takes place; tendency to transudation which is chiefly serous; increase of the ordinary function of the circulation, blood more and more retarded and changed in quality, exudation increased, serum and fibrine intermingle, all is verging into the *second stage* in which the leucocytes escape into the intervascular spaces. Second, *Active congestion.* The commotion continuing, the arterial vessels become interested, enlarge and pulsate with increased energy; leucocytes escape with great rapidity; blood flows on persistently



and burdens the capillaries; relaxation and overdistention; circulation stagnant; red corpuscles leave center of channel and encroach upon lymph spaces; coats of the vessels become spongy; blood degenerated; nutrition in abeyance; copious exudation of serum and fibrine; function perverted; part is leaving the confines of health; coats of the vessels yield to the pressure from behind. *True inflammation*, or third stage. Changes begun are completed; liquor sanguinis extravasated in mass; intervascular spaces filled with changed blood; disintegration takes place; blood takes circuitous course; absorption in abeyance; structure changed; molecular death; suppuration in progress. Illustration; the vaccine pustule; three stages; *excitement*, *congestion*, and *true inflammation*; section of the disc gives, *exaltation*, *congestion*, *degeneration*.



Attendant Phenomena.—*Heat*, *Pain*, *Redness* and *Swelling*. —*Heat* is caused by Hyperæmia of the affected part with increased action of the blood. *Pain* is produced by pressure upon, or stretching of the nerve filaments through hyperæmia and exudation. *Redness* is caused by Hyperæmia of the affected part with hemorrhage into the tissues, and *Swelling* is produced by effusion of serum or white corpuscles into the tissues with increased cell-growth.

Variations in the Phenomena.—The *local heat* in inflammation is modified by the activity of the inflammatory process, by its variety, and by the constitutional condition of the patient.

The function of the inflammed part is usually impaired; the eye can not bear light; a joint cannot be moved; the ear loses its normal activity, and abnormal sounds are present; the bladder cannot retain urine, etc., etc.

Redness varies both in degree and tint; the amount of blood regulates the intensity; the tint of redness is in proportion to the rate of circulation; redness may exist independent of inflammation: as in blushing and the ruddy hue of healthy activity;—in non-vascular tissues, as in bone, cartilage, ligament, etc., redness is comparatively slight. It is called *ramiform*, when seated in the small arteries and veins; *capilliform*, when the capillaries are principally involved; *uniform*, when all the capillaries are injected, as in erysipelas; *punctiform* when occurring in minute dots, as when the villi of mucous membranes are injected; *maculiform*, when the blood is extremely accumulated or extravasated at certain points; this form of redness is seen in hemorrhagic inflammations. The discoloration varies not only in degree, but in character and becomes an important diagnostic in determining the nature of disease. Thus the throat is scarlet in scarlatina; dark red or purplish in primary syphilis; yellowish in bilious erysipelas; copper-colored in constitutional syphilis, and black as in mortification. In arterial accumulation it is bright red, and in venous engorgements it is of a dark or purplish hue.

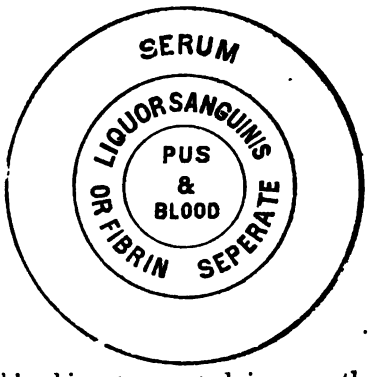
Pain is modified in degree: first, by the anatomical seat of the inflamed part; second, by the density of the tissues surrounding its seat; and third by the character of the inflammation. The quality of pain varies greatly and is the most characteristic of all the phenomena attending the inflammatory process. It is caused by the compression of the nerve filaments, *nervi vasorum*, and differs in intensity and character. It is burning in the skin; lancinating in the pleura; a sensation of heat and soreness in the mucous membranes; dull and oppressive in parts supplied with ganglionic nerves; hard and tense in bone, periostium, and ligament; greater in common than in specific inflammation; less severe if the products of inflammation can escape readily; often felt remote from the inflamed part, as pain in the knee is frequently diagnostic of hip-joint disease; pain in the penis and

bladder often indicates renal trouble; pain in the right shoulder is reflective of inflammation of the liver; and pain in the thigh points to inflammation of the pelvic viscera. Sometimes it is absent entirely as in adhesions in healthy and strong reactive constitutions. Thus we find intra-pleural adhesions after death that were not suspected during life. It is insidious and indolent as a rule in scrofula; or when the mental and physical sensibilities are obtunded by the habitual use of intoxicating liquors, or when the nervous system is depressed by toxic influences, as in pyæmia or typhoid fever. It is more severe in the coverings of an organ than in the structure itself. Pain oftentimes exists without inflammation as in *irritation*. Pain is increased by pressure in inflammation and in neuralgia it is relieved by the same agency; pain suddenly disappearing indicates great danger as in the last stage of hernia. Pain does not always accompany inflammation as in pneumonia which gives little or no pain, as also inflammation of Peyer's glands and acute abscess in paralyzed limbs. Pain is a peculiar mental perception which, as a prime agent in man's altered condition, suggests the necessity of rest to the organ inflamed; it is the admonition that the properties of repair are straying from the condition essential to its restoration. Pain exhausts the vital powers and therefore demands the earnest solicitude of the surgeon and physician.

Heat is always present in inflammation and is derived from the excess of blood to the part inflamed as the source of animal heat. Liebeg attributes heat to the oxydation of the tissues. Irritate the skin with a blister and heat is produced. It is the most constant of all the symptoms of inflammation, and is both subjective and objective; efferent blood flow, causes a higher temperature than the afferent; the inflamed part is always warmer than the corresponding part; increased vital effort produces increased textural waste or change. The degree of elevation may be from 1° to 10° F.; over 8°, prognosis is unfavorable,—sudden decline of temperature with a fall of 4° is ominous of danger.

Swelling is an undue accumulation of serum or white corpuscles in an inflamed part, with impaired functions; is seldom entirely absent in inflammation of external parts, but may be

absent in some of the internal structures. Mucous membranes, except when they are supplied with loose cellular tissue, are, as a rule, exempt from this process. It is caused by the escape of a portion of the vascular contents into the intervascular spaces. In the earliest stage it is chiefly *serous*, in a later stage, *fibrin* more or less separated from its serum exudes, and lastly serum, fibrin, and blood is extravasated in mass, the result of vascular degeneration; ultimately, purulent matter, more or less advanced, is formed. Swelling varies with the ability of the tissue to *hold exudation*, or to allow of cell-growth; is most marked, therefore, in loose areolar tissue, or in the kidneys.



Classification of Inflammation.—First, A, on the basis of pathology; second, B, on the basis of its severity and duration; third, C, on that of its causation. Its pathological varieties are: *vascular*, *cellular*, *necrotic*, *necroto-reparative*, *hyperplastic*, and *tubercular*.

A. The *Vascular* variety is that where the *vessels* of the affected part exhibit the most marked inflammatory changes.

The *Cellular* is that where the *cells* of the part are chiefly involved.

The *Necrotic* is where the part inflamed dies from arrest of nutrition.

The *Necroto-Reparative* is where the inflamed part has, to a certain extent, lost its vitality, but eventually regains it.

The *Hyperplastic* is where the part has taken on a *new connective tissue development.*

The *Tubercular* is a deposit of *miliary tubercle* in a part.

B. The varieties on the basis of its *severity* and *duration* are:

1st.—*Acute inflammation*, where the changes in the affected part are rapid and the effects correspondingly severe.

2d.—*Chronic inflammation* where the changes in the affected part

come on gradually and are of a marked lower type than the former.

c. The varieties depending on the *basis of causation* are:

1st.—*Traumatic*, which are produced by external injuries, and mechanical or chemical violence.

2d.—*Infective*, which depend upon the transmission of infective materials, carried along the blood-vessels or lymphatics, from some local infecting centre, as pyæmia, etc.

3d.—*Idiopathic*, where there is no obvious exciting cause in existence.

4th.—*Specific*, where the inflammation exhibits distinctive peculiarities, as in erysipelas, small pox, typhoid fever, and diphtheria.

In *acute inflammation* the constitutional symptoms are, severe irritation, quick pulse, shivering, increased temperature, dry skin, parched mouth, coated tongue, scanty urine, constipated bowels, failure of appetite, etc. The *local changes* are in accordance with its severity. The *duration* is short; the *changes in tissue* are rapid; the injury sustained by the blood-vessels and tissues is correspondingly severe; the *vascular phenomena* are prominent; the exudative process is excessive; suppuration is frequent; and *organization of the inflammatory products* is rare.

In *chronic inflammation* all the constitutional symptoms are less violent and more tardy than in the preceding. Irritation is usually slight; duration prolonged; changes in tissues are slower and less extensive; injury to the affected tissues is less severe; vascular phenomena are less prominent; the exudation processes are less abundant, suppuration is rare, and *organization of the inflammatory products* is the rule.

Etiology.—The causes of the inflammatory process may be either *predisposing* or *exciting*.

Among the *predisposing* causes may be mentioned, *chronic irritation*, (produced by poverty, bad ventilation, poor regimen, etc.); *old age*, (by defective heart power, and altered capillaries); *exhaustive diseases*, (as bed-sores and continued fever); *local diseases of blood-vessels*, (by causing imperfect nutrition to the tissues); *previous inflammation*, (by depressing the reactive tissue power);

abuse of alcohol; plethora; climate; temperature, (by extremes of heat and cold); *atmospheric poisons,* (by malaria, sewer gases, chemical vapors, etc.); and *bad hygienic conditions.*

Exciting Causes.—A *direct irritation from chemical agents; mechanical injuries of every form and kind; influence of morbid materials generated within the body; altered state of local nerves; abnormal properties in the blood; direct contagion arising from virus, poisonous and decomposing pus.*

Microscopical Appearances.—Among the changes that have been observed by the microscope are: first, *momentary spasm*; the irritable capillaries suddenly contract, which is followed by *dilatation of the capillaries* or a partial paralysis of the vessels, *first stage;* then follows retardation of the blood current, a stagnation of the vital fluid. This is succeeded by transudation of plasma elements; the walls of the vessels are thin and altered in structure and thus permit easy *transudation of white corpuscles, second stage.* Here nutritive cell activity is observed by the rapid movements and proliferation of the leucocytes, conjoined with these changes there is transudation of red-blood corpuscles and extravasation of blood in mass into the intervascular spaces, either by rupture of the capillaries or some alteration in their walls; *third stage.*

Termination and Effects.—There are two ways in which inflammation may terminate: first, by the *death* of the patient; second, by *resolution* through which the circulation may recover itself, healthy nutrition be restored, effusion absorbed, function and secretion reestablished, and the part returned to its normal state.

The *effects* are *Tumefaction, Induration, Softening, Suppuration, Ulceration,* and *Mortification.*

Tumefaction of tissue always follows the severer forms of inflammation and is produced by the excessive flow of blood to the part through the dilated capillaries. Often it is the result of an accompanying œdema of the inflamed structures. It is attended with local pain and tenderness, and also by a local, perhaps a general rise in temperature.

Induration of structure depends upon abnormal connective tissue cell-growth, which becomes organized and developed into

new tissue resulting in interstitial deposit of plastic material. It is the outgrowth of chronic inflammatory processes and requires slow development and organization to produce it. In *acute* inflammation the process of cell-growth is too rapid for organization, hence disintegration and suppuration follow. These indurations of structure are rarely associated with pain or local symptoms, after disappearance of the cause producing it, and are as a rule gradually removed by natural processes; by a process of fatty degeneration and absorption.

Softening follows the more acute forms of inflammation as the result of impaired nutrition. It is characterized by a loss of cohesion of the affected structures and varies from the slightest changes of structure to complete pulpification.

Suppuration is a disorganization of structure and the formation of pus, accompanying superficial ulceration or granulative processes, or it may be a *circumscribed* process, as—abscess, furuncle, anthrax, suppurative inflammation of glands and organs, are the types of this variety. Sinuses and fistulæ indicate sources of irritation, as caries, necrosis, foreign bodies, etc. Pus consists of two elements: the puss-cell or lymph corpuscle and serum. Its amount depends upon the extent of transudation in inflammation. The pus-cell is a degenerate leucocyte microscopically; it is found in two conditions, as a *secretion* on a free surface, or enclosed in a cavity—in the former it is *reparative*, in the latter *degenerative*. Suppuration is the result of the reparative process and is a true luxuriation. When profuse and long continued it gives rise to *Hectic*.

Varieties of pus are, *laudable* or healthy, *unhealthy*, *specific*, and *sanious*. When combined with other products, it is called muco-purulent, and sero-purulent. It is thin in ichor, flaky in scrofula, bloody in sanies, offensive in sordes.

Analysis of pus shows proximately:

Water, - - - - - - -	86.1
Fat and Comazome, - - - - -	5.9
Albumen pyine cells, - - - -	7.4
Extractive, - - - - -	0.6
	100.0

Sanious pus is due to rapid absorption of tissue with capillary hemorrhage. *Scrofulous* pus is due to degeneration or disin-

tegration of the purulent elements, frequently containing fragments of the tissues in a partially dissolved condition. *Laudable* pus forms rapidly and abundantly and is largely supplied with leucocytes. Pus as such is never absorbed into the circulation.

Ulceration is a solution of continuity of soft tissues, dependent upon molecular death and occurs upon the *surfaces* of organs and tissues and in the *lining coat* of blood-vessels and serous membranes. It may result from: 1st, *Enfeebled circulation*, or *defective nutrition, specific diseases, direct inflammation, abnormal blood conditions.* They are classified as *healthy, indolent, irritable, inflamed, hemorrhagic, varicose,* and phagedænic ulcers. Skin, mucous membranes, and cellular tissues yield rapidly; the vascular, nervous, and fibrous structures less so. Parts remote from the center of circulation, newly-formed structures, cicatricial tissue, callosities, tumors, etc., are more liable to ulceration than other parts.

Mortification comprehends the dying and death of a part. A state of complete death is called *sphacelus.* Gangrene is divided into *moist, dry* and *hospital.* The moist is the result of obstructed venous return; the dry, of impaired arterial supply, and the *hospital* depends upon some epidemic poison producing a tendency to phagedæna. It may result from local injury, excessive heat or cold, escharotics, inflammatory congestion, œdema, embolism, thrombosis, old age, atheroma, and abnormal blood conditions, ergot, phosphorus, the poison of glanders, and the inoculation of farcy. The *dry* gangrene is known by a simple withering and mummifying of the part. In the *moist,* the part is soft, dark, and infiltrated with gases from decomposition, causing an emphysematous crackling on pressure. Blebs appear upon the surface, offensive in odor, and finally the lines of demarkation and separation take place, and as the result spachelus or slough occurs.

Treatment.—The treatment of inflammation is *prophylactic, constitutional* and *local.* The *prophylactic* comprehends almost every remedy known to our materia medica. Among the most important are *Acid phos., Acon., Baptis., Bry., Calc., Baryta , Bell., Cham., China, Crotal., Eupat. per., Gels., Graph., Hepar s., Lach.,*

Lycop., Merc., Nitric Ac., Opium, Petrol., Rhus tox., Rhus rad., Staph., Sepia., Silic., and *Sulph.*

The *constitutional* are: *Acid Mur., Acid Phos., Acon., Arn., Agaric, Apium vir., Ars., Baptis., Bry., Canth., Cham., China, Calc., Crotal., Gelsem., Hepar s., Kali. jod., Merc., Mang., Nitric Ac., Petrol., Puls., Rhus, Sulph., Verat v.*

Local Treatment.—Rest; position; incisions; medicated applications; warm medicated fomentations; stuping; cataplasms; escharotics; pressure; acupuncturation; galvanism.

Abscess.—*Definition:* "Collection of pus in the substance of an organ." Varieties: *Acute* and *chronic;* these are subdivided into *Phlegmonous, Scrofulous,* and *Pyæmic.* Besides these they are designated by the tissues in which they form, as abscess of the liver, lung or brain. The one constant factor is *pus.*

Acute abscess is the typical form and is always circumscribed, hot, and develops rapidly. Pus forms at a given point; a limiting membrane (pyogenic) is formed and swelling results; inflammation exists in the outset with rigors, pain, and throbbing or pulsation; the swelling becomes circumscribed and of a conical form; the skin is inflamed and discolored; the growth is at first hard, then becomes boggy and doughy, with fluctuation at a certain part, which is termed "pointing"; necrosis or molecular death takes place at this thinned spot and finally the tissues yield, giving exit to the imprisoned pus; or, it may be evacuated by the surgeon. The tendency of pus is to burrow between muscles or fasciæ for long distances, which is prevented by an artificial evacuation. *Specific* abscess, is that produced by some specific virus as the syphilitic or gonorrhœal.

Chronic abscess, usually found in scrofulous patients, affects the glands and is characterized by slow growth, and painlessness; there is no heat of surface; the suppurative process is slow and during the time the health of the patient is not much impaired; the pyogenic membrane is thicker, but softer and more friable than in the acute variety; pointing is late in the disease and often at a remote part and is rarely near the surface. It grows to be of a very large size, the skin is usually pale and seldom œdematous or adherent. In cases of diagnostic doubt, use the aspir-

ator or exploring needle; abscesses are called *primary* when they originate and develop in a certain spot, the point of attack; *metastatic*, when they change from one part to another.

Sympathetic abscess is the "cold" variety of some authors and is a true indolent abscess, growing slowly, frequently acquiring a large size, irregularly circumscribed and apparently formed without any very palpable evidences of pre-existing inflammation. The contents of these abscesses are variable; sometimes glassy, turbid, flaky, and dark-colored. Their most frequent seat is upon the back, in the axilla, about the neck, or upon the thigh or leg.

Treatment.—1st. Dispersion of the tumor before disintegration. 2d. Modifying its characteristics and to evacuate its contents. 3d. Arrest of the discharge and promotion of the healing process. 4th. To rectify faults of constitution.

The first may be frequently accomplished by giving internally *Hepar s.*, *Merc.*, *Calc.*, or *Sulph.* Externally may be applied *stimulating* applications to the skin directly over the abscess, or *hyperdistension* may be used as follows: evacuate the contents by aspiration, throw in an injection of *Calendula* or *Hydrastis* and thoroughly cleanse the inner sac till all pus is removed, then apply the drainage tube and well directed pressure.

The internal remedies are *Ars.*, *Baryta.*, *Bell.*, *Bry. Calc. c.*, *Calc jod.*, *Calend.*, *Carbo veg.*, *Cham.*, *China*, *Graph.*, *Hepar s.*, *Iodine*, *Lyc.*, *Merc.*, *Phos.*, *Puls.*, *Rhus.*, *Silic.*, and *Sulph*, according to characteristics.

Special Indications.—**Aconite.**—Violent burning, cutting pains; great nervousness and fever; apprehensions evening and night.

Apis.—Stinging, burning, great swelling (incipient stage).

Arsenic.—Burning pain with restlessness; discharge watery, bloody, putrid; prostration; threatened gangrene (Lach).

Asafœt.—Discharge watery, colorless; great pain after touching; adjacent parts very sensitive.

Baryta c.—Scanty discharge with flocculi; lymph glands affected.

Bell.—Discharge scanty with flocculi; skin bright red and smooth; pains burning, come and go suddenly.

Calend.—Profuse laudable discharge with constitutional impairment; induration of the adjoining structures.

Hepar s.—Pus forming rapidly *before* rupture, pricking, throbbing pain *after* rupture; discharge scanty, bloody, smelling like old cheese—after mercury and syphilis.

Lach.—Dark purple color of skin; threatened gangrene (ars.) septic causes.

Merc.—Discharge copious, bloody, yellow, thick or thin, corroding and fetid; pus forms slowly; pain worse at night after syphilis.

Phos.—Discharge thin, bloody; bleeds easily; burning, stinging—mammary abscess.

Phytol.—Mammary abscess, early stage.

Puls.—Bleeds easily (Phos) itching, burning; discharge copious—females.

Rhus tox.—Discharge bloody, serous, axillary glands implicated.

Sil.—Discharge laudable, watery, fetid, after opening to promote healing; deep-seated abscess; constitutional impairment.

Sulph.—Chronic cases; tendency to repeated attacks.

Ulceration.—Definition: "Molecular death" of a part. and is divided into two stages. 1st. Where the tissues are broken down by the process of disintegration. 2nd. Where the *debris* is removed or discharged. The more active the ulcerative process and its disintegration, the less laudable is the purulent discharge. It is called *acute* when it advances steadily with moderate inflammation; *inflamed* when the excitement is higher, more rapid, painful, and accompanied by greater redness, heat and swelling; *phagedænic* when the excitement is still higher, with diminished local power, and destruction so rapid that the part seems to consume or melt away. Persons debilitated by intemperance, advancing age, privations, syphilis, loss of nerve force, scrofula, mercurialism, are most liable to it. Tall persons, and parts newly formed, those remote from the center of circulation, as well as those in which the blood-flow is weak and languid, or impeded by any cause, are also prone to it. An impaired or faulty nutrition, unfavorable changes in the circulation, and alterations of texture, favor this process.

Exciting Causes of Ulceration are, acute inflammation, mechanical injuries, chemical irritants and continuous pressure.

Healthy ulcers show a tendency to reparation; the granulations are healthy, red, small, and numerous; pus laudable and creamy, easily detached; edges smooth and covered with a white pellicle gradually merging into the margin of the granulations; heals spontaneously and regularly, leaving little or no trace of having existed. Example, furunculus or common boil, usually painless, tender to touch, without disposition to bleed. *Treatment:* Internal remedies are *Ars.*, *Hepar s.*, *Calc. c.*, *Dulc.*, and *Puls.*

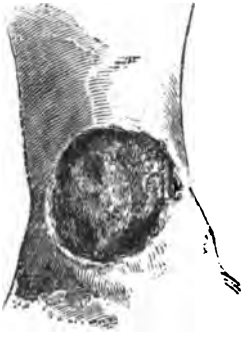
Local Treatment: Rest, position, and *Calend.* Expose to air to form scab; apply raw cotton or lint if weak and not extensive, protect from external violence. Calamina cerate applied to the surface is highly recommended.

Irritable is very tender to touch, bleeds easily, and is preceded by an irritable state of the system; digestion is impaired. Is met with in the higher walks of life, and is brought about by excesses in eating, drinking, and other things. Its edges are ragged, inverted, and serrated; floor irregular in depth; parts

contiguous are red, inflamed, and frequently œdematous; the discharge is thin, ichorous or sanious fluid, and is often so acrid as to excoriate the skin from contact. Granulations are imperfectly developed, and often entirely absent; in lieu of them is found a dark, red, spongy mass, having a grayish film, acutely sensitive, and bleeds at the slightest touch, the blood oozing away, being of a dark, grumous character.

Treatment.—Internal remedies: *Asa.*, *Ars.*, *Bell.*, *Carbo. v.* *Canth.*, *Caust.*, *Ham. Hepar s.*, *Hyperic.*, *Kreas.*, *Merc.*, *Puls.*, *Nitric ac.*, *Rhus rad.*, *Staph.*, *Solan*, *Silic.*, *Sulph.*, Correct faults of constitution. Apply locally: *Bell.*, *Hydrast*, *Hyperic.*, *Ranun.*, *Canth.*, *Caust.*, *Sulph.*, and *Staph.* Exact perfect rest. Cleanse ulcer with warm, medicated lotions three times a day, of either of the foregoing remedies, and apply light compresses, warm and continually moistened with the remedy and covered over with oil silk for warmth and moisture.

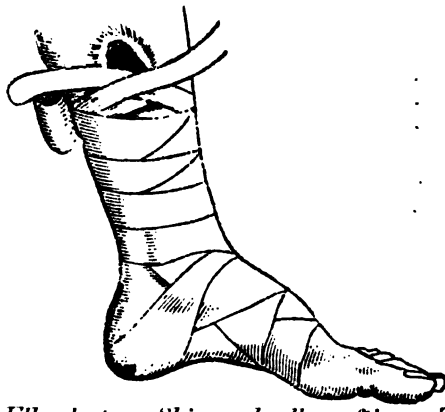
Indolent is most frequent of all ulcers. Occurs generally on lower extremities, in poor persons, in old age; called "poor man's ulcer." It is a secondary formation having passed through the stages of inflammation. Is in direct contrast with the irritable sore. Granulations are entirely wanting, or are else very few, pale, small and firm. Surface is excavated, pale, smooth and glossy. Edges are elevated, rounded, blue, smooth, thick, and everted, giving to the sore an excavated look. Great insensibility. The surrounding integument is discolored and swollen by passive congestion. It presents the appearance of a patch of pale mucous membrane set in a dense, high ring of cartilage, and covered with a pellicle or crust of a whitish or dark-gray color, so tenacious that it can with difficulty be separated from the floor of the ulcer.



Treatment.—Remedies are internally, *Ars.*, *Calc.*, *Caust.*, *Cham.*, *Carbo. v.*, *Clem.*, *Graph.*, *Iod.*, *Merc.*, *Phos. ac.*, *Secale.*,

Silic., *Sulph.*, *Sanguin.*, *Sepia.*, *Thuya.*, and *Zinc*, and due attention to systemic faults.

Local Treatment.—Rest; position; cleanliness; even support by a roller; adhesive straps; the sore having been *first* filled with a trituration of *ars.*, *merc.*, the *oxide of zinc*, or *acid nitrate of mercury*. *Carbon sulphide* is highly recommended and also *chloralum*. Never wipe the surface too harshly. Incise cartilaginous ring or border.



Elkoplasty. Skin and cell grafting. The *earth treatment.*

Inflamed.—Like the last, this ulcer is the result of improper treatment of either of the preceding. The granulations are large dark, and firm at first. They then slough away and soon disappear, partially or entirely. Pus is thick, offensive and streaked with blood; edges raised with sharp outline, and very much inflamed which extends into adjoining parts. Pain is severe, varying, perhaps pulsating, and the sore is very sensitive to pressure.

Treatment.—Remedies: *Arn.*, *Acid mur.*, *Bell.*, *Hyperic.*, *Calend.*, *Canth.*, *Caust.*, *Clem.*, *Hepar s.*, *Kali c.*, *Kreos.*, *Lyc.*, *Merc.*, *Phos.*, *Ruta.*, *Sepia.*, *Staph.*, *Thuya.* Local treatment as recommended in the *irritable* variety.

Hæmorrhagic.—Similar to the irritable. Frequently met with in females suffering from menstrual irregularities. It is a small, circular, deep, purplish-colored ulcer; exceedingly painful and sensitive; regular in shape, with clear-cut edges, as if done by a gouge. During the menstrual epoch it oozes blood; at other times the discharge is varied, resembling that of the irritable variety.

Treatment.—Remedies: *Acid phos.*, *Ars.*, *Bovista*, *Calc.*, *Calend.*, *Caust.*, *Hyperic.*, *Graph.*, *Kali*, *Iod.*, *Lyc.*, *Merc.*, *Puls.*, *Sepia.*, and *Sulph.* Local treatment, same as the irritable.

Varicose is a variety of the indolent, and precedes or follows a varicose condition of the veins of the legs or thigh. Usually occurs on the inner side of the leg. Difficult to cure. There is no tumidity of its edges, and it presents a blue or purple appearance; the sore is seldom deep; spreads, and is oval in shape. The branches of the saphena are enlarged and tortuous; the varicose condition antagonizes the cure. The limb is often swollen from the varicose degeneration; the coats of the veins are thickened; vitality impaired; temperature diminished; parts bluish, and are very prone to inflammation and disintegration. Often the *irritable* ulcer is accompanied with varicose veins. The pain is deep-seated, except along the course of the veins, and is increased in the upright position. The varicose condition requires the first attention of the surgeon.

Treatment the same as recommended in the indolent and irritable varieties, depending upon the leading characteristics. For the varicose condition of the veins give *Fluoric ac.*, *Merc.*, *Ars.*, *Carbo veg.*, *Iodium*, *Ham.*, *Puls.*, *Lach.*, *Nux.*, and *Sulph.*

Surgical Treatment.—Ligation of vein. Lace stocking. Excision of vein. Subvenous needle and figure of 8 ligature. Plaster of paris cast. Electricity. Galvanism.

Phagedæna is a peculiar variety of ulcer with copious exudation and infiltration of the part affected, with rapid and persistent decomposition. The surface of the sore is irregular, whitish or yellowish. Discharge serous or bloody, and often profuse and painful. Some cases are attended with violent inflammation, the margin of the sore being highly painful, red and swollen. Atony and debility accompany other varieties with a pale, dusky or livid margin. Described more particularly under Hospital Gangrene and syphilis.

Local Treatment for phagedæna is *Calamina* and *Iodoform Cerates*, *Chloride of Zinc paste*, *Carbolic Acid paste*, *Baptisia* and *Charcoal poultices*, *Permanganate of Potash*, and as a last resort the actual or the galvanic cautery. The fuming nitric acid I have used with better effects than either of the two last.

Special Indications.—Acid m.—Stinging, itching and painful ulcers, fetid odor putrid ulcers with burning or jerking pains, pus fetid and scanty; covered with a thin crust; acts well on either side.

Acid n'it.—Ulcer sensitive and offensive, with shooting, burning pains, edges burning; superficial or mercurial ulcers, readily bleeding, sensitive to touch or bathing in cold water;

fistulous ulcers, pricking pain, pus copious, bloody; ichorous and corroding. Either side.

Ammon. carb.—Flat, putrid ulcers, with a pungent sensation; elevating limb relieves; pus white and putrid. Either side.

Antim. crud.—Deep ulcers, fistulas, spongy ulcer, itching or pricking, exuberant granulations, worse from heat, pus scanty. Left side.

Ars.—Burning and putrid ulcers, elevated edges, areola red and shining, with œdema, floor of ulcers dark or lardaceous, exuberant granulations with fetid ichor, bleed easily; gangrenous or inflamed ulcers, pus copious, ichorous, corrosive and bloody, or thin and watery, ulceration extending in breadth. Either side.

Asafœt.—High, hard edges, sensitive, bleed easily, shooting, pricking pain around edges, pus profuse, greenish, thin, offensive, ichorous, with black floor, and bone ulcers with thin, fetid, ichorous pus; ulcers from burns and scalds, with great sensitiveness. Either side.

Aurum.—Deep bone ulcers, especially about the head and face; cancerous and mercurial ulcers, purplish, dark red, swollen and painful, itching, shooting and burning; pus yellow and fetid; sad and gloomy. Either side.

Baryta c.—Ulcers on tonsils; tensive, gnawing pain, scabby, crusty, indurated, painless and difficult to heal, pus gelatinous, scanty or entirely absent; after diphtheria. Left side.

Calc. c.—Scrofulous ulcers, fistulas, carious, inflamed or putrid; feeble, pale granulations; throbbing, tearing pain, with systemic implication; hard cartilaginous edges, pus scanty and albuminous. Either side.

Canth.—Irritable ulcers with itching, stinging, burning, lacerating pains, made worse by rubbing; pus copious, yellow, odorless, tinged with blood. Right side.

Carbo v.—Scrofulous ulcers, varicose, livid, fetid and easily bleeding; secretion scanty, corroding and fetid.

Caust.—Bleeding ulcers, with blisters on the surrounding skin; burning, boring pain on the edges, with a feeling of tension, swelling and sensitiveness; pus bloody, corroding, ichorous and thin as water; acts better on right side.

China.—Ichorous, sensitive ulcers, with putrid smell; flat, shallow base with copious discharge; carious ulcers, attended with copious perspiration, painful sensation on moving; pus bloody, ichorous and fetid; system cachectic, or emaciated from any cause. Either side.

Bell.—Congestive, irritable ulcers with red areola, swelling of the surrounding skin; inflamed and painful; pus scanty, bloody and ichorous; acts better on right side.

Conium.—Blackish ulcers after contusion, deep and burning pains, fistulas, ulcers with hard edges; cancerous ulcers; stitching pains; gangrenous edges, old, swollen and inflamed; bluish border; night aggravations; pus fetid, thin and ichorous. Right side.

Fluoric ac.—Painful ulcers with copious discharge; varicose ulcers with burning pain, increased by warmth; pus yellowish.

Graph.—Old ulcers, fetid, irritable, pain, itching and stinging; cracks and fissures in the skin, indisposed to heal; sensitive, sore, spongy ulcers; crusted and scabby; pus bloody, acrid and corroding; smelling like herring brine. Right side.

Hepar s.—Ulcers smell like old cheese, edges sensitive, pulsating, stinging burning pain; mercurial and indolent ulcers, edges ragged, pus laudable, or acrid and bloody. Left side.

Kali bi.—Dry and deep ulcers, hard base, depressed cicatrix, edges overhanging, and red areola. Either side.

Lach.—Gangrenous, moist, purplish and sensitive ulcers; discharge ichorous and offensive; phagedænic with ragged edges, surrounded by papillæ or small livid ulcers. Left side.

Merc.—Superficial, bleeding ulcers with lardaceous base, worse from warmth; spreading, painful and sensitive; gnawing and throbbing pains, edges bluish or livid, hard, elevated and ragged edges; pus scanty or copious, never laudable; whitish superficial ulcer. Either side.

Phosph.—Fistulas with hard callous edges, gnawing pain, hectic, pus thin, ichorous, influenced by weather changes. Either side.

Psorinum.—Itching ulcers over the whole body, oozing blisters on legs, small pustules increasing in size with tearing pain, crusty eruptions all over; body has foul smell. Either side.

Sang.—Old indolent ulcers, callous edges, languid circulation, sensitive to weather changes.

Sepia.—Painless ulcers on fingers and toes, exuberant granulations, hard, elevated edges, want of sensitiveness: sore, spongy ulcers, itching pricking pains, pustules around ulcer. Right side.

Silic.—Deep ulcers in membranes with aching, pulsating pains, base or edges black, bleed easily, fistulas or sinuses involving bone or ligament; with hard, shiny edges, pus copious, brownish or grayish, or bloody and ichorous; worse from weather changes; in scrofulous or broken constitutions, worse from lying on painful side. Either side.

Sulph.—Old and fetid ulcers, raised swollen edges, bleeding easily, pimples around the borders, tearing, stinging pains, fistulas and sinuses in scrofulous or cachectic persons, œdematous swellings with discoloration of skin; variable ulcer with luxuriant granulations, pus thick and fetid, or thin and fetid. Left side.

Thuja.—Flat ulcers after gonorrhœa with indurated edges, deep, burning and fistulous ulcers, with itching, burning pain; rubbing relieves; ulcers with serrated edges and spongy. Either side.

Zincum.—Herpetic ulcers, non-sensitive, with redness of skin, burn and bleed easily; pus bloody and corroding; tearing and feeling of tension of the ulcer. Left side.

Mortification is the general term comprehending the whole process of death in a part from its beginning to the terminati

of the process. The process of dying is called *gangrene*, and its complete death *sphacelus*. Other distinctions are made: as the acute and chronic, traumatic and idiopathic. The process may be divided into three stages: the death of the *part*; a period of arrest of the plastic deposit; and that of separation and granulation. The humid, acute, or traumatic gangrene generally depends upon venous obstruction, and is usually accompanied by inflammation; the dry, chronic, or idiopathic occurs as a rule without inflammation, the fluids being retained in the former and gradually parted with in the latter. The humid or acute form is attended with inflammation; swelling; diminished temperature; blueness of the surface: part is covered with vesicles; peculiar crepitus on pressure; general condition of patient suffers; the countenance expresses anguish with hiccough; delirium, and perhaps death. This picture represents ordinary acute gangrene. *Traumatic* gangrene occurs from severe railroad injuries; parts crushed and pulpified; injured structures suffer and die immediately and gangrene spreads rapidly. In such cases do not wait for line of demarkation; delay is death; amputation to be successful should be prompt. Senile gangrene is a peculiar form incident to old age. It commences with a purple or black spot on one of the smaller toes; the cuticle is found detached, and the underlying skin is of a dark, red color. It is painful at night; patients feel uneasy; its progress is usually slow; at times exceedingly rapid and painful; the parts soon die; are dry, shrunken, and hard; there is sometimes a temporary pause and the parts slough away; then a fresh accession of gangrene occurs and cicatrization progresses. Life is prolonged in this way for several years before exhaustion and death takes place.

Causes of Gangrene are impeded circulation; ligature of a ves-

sel; improperly applied roller; old age; calcareous degeneration of vessels, known as ossification; embolism; thrombosis; long continued pressure, as in "bed sores;" ergotism; plagues and epidemics; yellow fever; scurvy; bites of serpents; intense and long applied cold; gun shot wounds; injuries; infiltration of urine in to the cellular tissue.

Treatment.—Remedies are *Ars.*, *Crotal.*, *Lach.*, *Carbo v.*, *Secale cor.*,—to which may be added in the second class, *Ac.*, *Bell.*, *China*, *Euphorb.*, *Helleb.*, *Hyos.*, *Iodine*, *Sabin.*, *Squill.*, and *Sulph.*

Special Indications.—Ac.—Deadly paleness of face, shuddering, restlessness and sleeplessness. After swelling, parts become black—fever.

Arn.—Gangrene following contusions.

Ars.—Numbness, stiffness, insensibility with swelling and pain; hot, shining, burning red spots and bluish blisters; hard, red, painful swellings; gangrene with fetid diarrhœa; great weakness and emaciation; coldness and heat alternately.

Crotal.—Hot, bluish, moist gangrene; fever and chills of a severe type; limb swollen and covered with black blisters; emitting a foul, cadaverous smell; grayish white mass; strength greatly reduced; pulse quick and small; skin hot and dry; tongue livid thick.

Carbo v.—Senile gangrene—humid gangrene in cachectic persons with weak vitality; foulness of the secretions, great prostration.

Lach.—Gangrenous blisters, look bluish or black; vesicles increasing in size, with violent itching and burning, swelling and inflammation, violent pains, heat and thirst, fever, cracked skin and deep rhagades, coldness of the part; painful spots appear on rubbing, with dark-blue borders; traumatic gangrene.

Secale c.—Dry gangrene of the extremities; parts are dry, hard, cold and insensible, black and free from fœtor. Large ecchymoses, blood blisters becoming gangrenous; limbs cold, pale and shrivelled, with insensibility.

Local Treatment.—Preserve warmth of part; carded wool; cataplasm of Frasera Carolinensis; Ulmus and Dipascus sylvestris; Carbolic Acid, Chlorine and Bromium; *operative procedure* whenever demanded.

Hospital Gangrene. Synonyms: Hospital Sore; Sloughing Ulcer, and Phagedæna, was the scourge of hospitals in former days, especially during the Napoleonic and Anglo-Russian wars when it was extremely destructive. Now it is almost unknown by the proper application of drainage, sewerage, ventilation and hygiene. Its symptoms are like the phagedænic ulcer engrafted upon a slight wound. Part is painful and inflamed. Previous discharges are arrested. Surface is covered with gray spots of gangrene which spread and deepen. The skin is livid and swollen. Edges of sore are rough and everted. The slough is pulpy and tenacious; its separation is accompanied with offensive discharges; it attacks sores and wounds; is induced by salivation at times; mercury also increases its liability. The pulse runs high. Patient is debilitated, and is often attacked with profuse perspiration or colliquative diarrhœa. The only affection with

which it may be confounded is Scurvy; but it is easily distinguished from the latter by the characters of the scorbutic ulcer which is peculiarly *livid, fungous, bloody* and *fetid.* Its granulations are large, soft, spongy, rapid in growth, and bleed easily at the slightest touch. In scurvy there is entire absence of fever. Beside these, the history of the case makes it no longer dubious.

Prognosis: As an epidemic, fatal. Broken systems fare worse than the healthy and vigorous. The violence and extent of the disease exerts a marked influence upon its fatality. The danger is less when it is slight and correspondingly greater when it is considerable. Complications of internal organs increase its fatality. In purulent infection, septicæmia is uniformly fatal. Death occurs from hæmorrhages and exhaustion.

Treatment.—Remedies are *Ars., Crotal. Lach., Kreas., Carbolic ac., Carbo v., Mur. ac., Nit., ac. Rhus tox., Secale* and *Zinc.* (See gangrene).

Local Treatment.—*Chloride of Zinc* or *Carbolic Acid* as an escharotic. Cleanliness and great care as to the dressings and vessels employed. Walls and floor thoroughly cleaned and disinfected. Ventilation. Cataplasms of yeast. Red Cinchona bark and charcoal applied to the part. *Bromium* and *Carbolic Acid* as antiseptics. Good diet. Stimulating drinks, such as milk punch and egg-nogg. In case of hæmorrhage ligate or cauterize the bleeding vessel. *Erigeron* and *Persulph. of Iron* as styptics. *Kali Permang.* has been highly extolled. Oxygen gas and transfusion of blood may be employed as remedies of last resort.

Prevention by the Antiseptic Method has been highly recommended in accordance with Lister's antiseptic plan of dressing to which the reader is referred.

Bed Sores are occasioned by pressure which induces consequent gangrene and sloughing of the parts long lain upon. This should be considered in all cases that require long confinement in bed. The first sign is redness of the skin termed *paratrimma;* they occur about the sacrum and spinal column. Begin with itching, burning, and pricking. Sloughs of a fetid odor and blackish hue follow. The underlying structures being often consumed to the bone. Here prevention is better than cure.

Local Treatment.—Lessen the amount of pressure. Use circular air cushions; hair or water pillows. Bathe the parts with equal parts of arnica and lime-water *before* the integument is broken. Afterwards the remedies recommended in gangrene. Richardson advises spraying the parts with carbolic acid, one one-hundredth, the solvent being *arnicated water* or *hypericum*. Crousel, of St. Petersburg, speaks highly of galvanism. Galvanism is thus applied: Cut a *thin* silver plate of exact size and shape of the ulcer to be covered and a thin zinc plate of exact size and pattern. Then cut a piece of chamois skin to correspond with the plates, immerse it in vinegar, place the silver plate in contact with the ulcer as closely as possible; the zinc plate on the plate above, the chamois skin intervening; connect the two plates by a fine copper wire, six or eight inches in length; keep the chamois skin *moist*. Granulations spring up within 24 hours, and cicatrization begins in 48 hours. It is said to be the best of all methods for the cure of bed sores and old ulcers. Mr. Spencer Wells advocates it as the best means of treating the sloughing sore.

Dipascus Syl.—The leaves dried and rubbed very fine and sprinkled over the gangrenous surface; the parts having been previously cleansed with chlorinated water, has proved efficacious in my hands.

Dr. J. C. Morgan extols local applications of white sugar and glycerine. I have used equal parts of lime water and first dilution of arnica prophylactically, having the parts well bathed with it three or four times a day. Eau de cologne and diluted brandy has been highly recommended. Dr. Brown Sequard applies sponges alternately moistened with hot and cold water. Keep each sponge pressed upon the part for one or two minutes, and continue the process for fifteen minutes at a time. If the suppuration is deep and extensive with fetid exhalations, a charcoal poultice, carbolic acid or a chlorinated solution of soda (Labarraque's solution) may be employed with advantage. For remedies consult gangrene, page 27.

Septicæmia.—*Synonyms:* Traumatic Fever, Pyæmia, Ichoræmia, Surgical fever—formerly pyæmia and phlebitis were con

sidered the same. The veins were supposed to absorb the infectious material and convey it into the circulation. Billroth proves that healthy pus does produce abnormal manifestations and fever, sometimes inflammation and suppuration when thrown into the circulation. It is of the gravest importance. Is frequent in hospital practice and is apparently contagious in crowded wards and where many wounded are placed together. Since the application of ventilation, drainage, disinfection and cleanliness, it is comparatively rare at the present day. It appears both in acute and chronic types—in the former the system is rapidly overwhelmed, while in the latter the symptoms creep on gradually. It often begins soon after severe surgical operations, rapidly terminates fatally, and is frequently the result of gun shot wounds. The symptoms are at first rigors; the pulse rises high to 130 or 140 beats per minute; the face flushes; respirations are quickened with more or less dyspnœa; diarrhœa supervenes with vomiting; the tongue is dry, shining, and red at the tip. Soon the disease attacks the wound; the pus becomes scanty and thin, and it then quickly extends to the surrounding structures; the color and condition of the skin varies; is of a leaden hue, and is covered with perspiration, often cold, but in some cases quite hot; the glands of the neck, parotid, submental, and those in other parts of the body become inflamed and suppurate The death of our late lamented President James A. Garfield was principally due to this terrible disease, caused by a gun shot wound. The ball of the assassin entered the abdomen, penetrated and crushed through the anterior portion of the vertebral column,(first lumbar) and became encapsulated in the soft structures, peritoneum. There is great depression of the nervous system; nausea and vomiting frequently accompany it, and is a grave symptom, especially after the firstforty-eight hours,—followed by utter prostration, collapse, and death.

In the chronic form the symptoms proceed more slowly. At first the patient is seized with a chill, which from its frequent occurence, resembles intermittent fever. The wound will now be observed to assume an unhealthy appearance; the pus becomes thinner, acrid, and even corrosive; fever, with slight intermission

sets in; the temperature rises to 104°; the tongue is furred and dry; eyes are sunken; thirst and restlessness develop, and toxæmia is evident; the patient is half-comatose, from which he can be aroused, but soon lapses into his previous unconscious position; the breath has the peculiar odor of new-mown hay; a marked icterode expression is present, accompanied with profuse sweats, aching in the bones and larger joints. An irritable cough may be present; the urine is scanty, high-colored, and often passed with difficulty; as the disease advances, typhus symptoms, with blotches of a dark purple hue, are observed; secondary abscesses are formed in the lungs, liver or kidneys; emaciation is rapid and death takes place in two or three weeks. Dissection reveals the presence of pus in the blood.

Pathology—Emboli: Pus-cell encapsulated; abscess and disorganization of inner coat of vessels; engorgement; arrested nutrition; molecular disintegration; suppuration; pus circulating in blood, and morbid changes therein; each new abscess is a new point of origin, which disintegrates and increases morbid products.

Treatment.—The success attending the treatment of this disease in the two prevailing schools is largely in favor of Homœopathy. Quiet, rest, a well-regulated diet; ventilation and disinfection must be regarded. Hypericum and calendula lotions applied to the wound; carbolic acid spray frequently employed about the ulcerated parts and bed clothes.

The remedies are *Ac.*, *Arn.*, *Apis.*, *Ars.*, *Canth.*, *Bap.*, *Carbo veg.*, *Lach.*, *Carb. an.*, *China*, *Bell.*, *Gels.*, *Verat. alb.*, *Merc.*, *Mur. ac.*, *Rhus*, *Phos.*, *Muriate of Ammonia*, *Rhus rad.*, etc. Stimulating drinks judiciously employed during treatment are valuable adjuncts to a cure.

Special Indications.—Ars.—Fever, great prostration, fetid breath and sweat, with decomposition of organic material—collapsed features, soporous condition with muttering delirium, grasping at flocks, subsultus tendinum, involuntary, bloody and cadaverous-smelling stools and even gangrenous ulcerations.

Carb. veg.—If symptoms of adynamia prevail, with apathy or sopor, faintness when rising in bed, trembling of the hands on holding any object, also tremulousness of the tongue—sliding down in bed.

Camph.—If a high degree of stupor prevails, skin cool, perspiration clammy, features collapsed, pulse small and filiform, petechiæ, ecchymoses of a bluish gray color.

Ergotin.—Violent nose bleed, vomiting of blood, or hæmorrhages from vagina.

Ferrum met.—Excessive dark hæmorrhages and their consequences, (also Nit. and Sulph. acids).

Moschus.—Long lasting syncope with rapid prostration.

China, and Chinin. ars.—Chills or shiverings succeeded by fever; long continued discharges with prostration. See Phos. and Mur. acid.

Rhus tox.—If contagion precede and great nervous irritation, dry or burning heat, with systemic irritation, loquacious or noisy delirium, circumscribed redness on cheeks,

great thirst, pulse hurried and feeble, grasping at flocks, subsultus tendinum, catching at imaginary objects, constant desire to get up and dress, petechiæ, blood stools, meteorism and clammy sweats.

Sulph. or Nit. acids.—Excessive hemorrhage, fetid breath; consult typhus. *Arn.*, *Ammon. mur.*, *Ac.*, *Calend.*, *Eucalyp.*, *Lach.*, *Merc.*, *Rhus rad.*, and *Verat vir.*, may be consulted.

Rhus rad.—For chills and sweats; boils over the surface; rheumatic pains, swelling and suppuration of joints, and typhoid symptoms.

Tart. emetic and Zinc. m—Have controlled in my hands the nausea and irritability of the stomach. Iced champagne has given me good results.

Local Treatment.—If the wound is not open, cut out sutures, remove straps and bandages, spray wound with lotions of carbolic acid or calendula, vinegar or wine; sponging to surface. Transfusion and oxygen gas may be employed as a last resort.

Hectic Fever is a peculiar type of fever with frequent remissions during the middle of the day, with profuse sweats following slight chilliness every day, shuddering, dry mouth, hot skin and breath, palms of the hands and soles of the feet burn, characteristic scarlet upon one or both cheeks, pulse over 100, temperature 101°; this lasts a few hours, and is succeeded by *colliquative* sweats or diarrhœa; between paroxysms patient is comfortable; emaciation continues; countenance becomes hippocratic; system exhausted with fatal prostration.

This fever frequently follows operations, or may be caused by continued drainage from disease.

Treatment must be conducted upon general principles and the effort of the surgeon must be to remove the exciting cause, and the remedy selected according to totality of symptoms. The most prominent remedies are *Ac. phos.*, *China.*, *Hepar s.*, *Samb.*, *Stan.* Consult the materia medica as to indications. If it is the result of preexisting disease, attention must be directed to the causes, which are numerous. The symptoms should be carefully considered, the pathological conditions investigated, and organic disturbances attended to. If the system and other conditions are favorable, the affected parts should be removed.

CHAPTER II.

EFFECTS OF HEAT AND COLD.

Burns and Scalds.—Heat, communicated from solid bodies causes burns, from fluid or gaseous bodies, produces scalds. Severity of burns depends upon the intensity of heat and duration of contact. Heated bodies injure more than heated liquids. The former char and extend deep into the structures. The latter spread and have more surface extent.

Varieties of forms are: 1st. Increased vascularity with slight inflammation of integument, unattended by vesication; tends to resolution. 2d. Vesicular, in which the cuticle is blistered, followed by ulceration. 3d. Death of the part burned; mortification. Dupuytren classifies them into six degrees: 1st. When the cuticle is merely scorched. 2d. When it is raised in blisters. 3d. When the cutis vera is more or less destroyed. 4th. When the cuticle and true skin is involved, reaching to the sub-cutaneous cellular tissue. 5th. When the muscles and fasciae are involved. 6th. When the whole thickness of structures is implicated with carbonization of the osseous tissue.

Effects of heat are dangerous according to intensity and extent of surface; are more serious upon the head and face and trunk, than upon the extremities. Children and old persons, and those of impaired health, suffer more than the middle aged. There are three stages of constitutional disturbance: 1st. Shock. 2d. Reaction and inflammation. 3d. Suppuration and exhaustion. Effects of shock are depression and congestion, with cold, shivering and collapse, which lasts from 36 to 48 hours; death in children is caused by coma. Reaction and inflammation takes place from the second day to the second week, and may be accompanied by sympathetic fever, inflammation of thoracic and abdominal organs, perforating ulcer of the duodenum, peritonitis and death, suppuration and exhaustion, hectic fever or pyæmia, congestion of the lungs or pleura, constitutional irritation, from long continued and exhaustive discharges.

Scalds effect extent of surface rather than depth, and the skin when affected to any considerable extent on account of its being richly endowed with nerves, implicates internal organs; appearance of the hair will determine the difference between burns and scalds. Scalds of the first-class, covering one-half of body may prove fatal. Second class, one-quarter of the body likely to produce death, and those of the third class are apt to produce death if one square foot of the body is affected.

Treatment of burns is constitutional and local. The first thing to be done is to bring about reaction and relieve constitutional disturbances, for which either of the following remedies may be used: *Ac.*, *Arn.*, *Carb. veg.*, *Coffea*, *China*, *Caust.*, *Hepar s.*, *Phos.*

Special Indications.—Phos. ac.—When there is hot skin, thirst, hard and frequent pulse.

Arn.—To allay extreme sensibility, general restlessness and intense pain at the seat of injury.

Arn.—If ulcers form and gangrene threatens.

Coffea.—To promote sleep and allay nervous excitement.

Caust.—For old burns, burns of the lips and tongue.

Carbo. veg.—In those extreme cases where the shock is so excessive as to threaten complete extinction of life. (See Secale).

Local Treatment is to apply *warm* applications, preserve an uniform temperature, and prevent contact of air with the wound. Applications of *Canth.*, *Rhus rad.*, *Urtica urens*, and *Terebinth*, (1 ounce of the tincture to 4 ounces of water), are our most valuable remedies. Dr. Ludlam recommends urtica urens and olive oil mixed, one dram of the tincture to 8 ounces of oil. Apply pledgets saturated with the mixture to the part. Cleghorn advises warm vinegar, creosote water (one dram to one pint of water) as a valuable remedy. *Bi carb. Soda* is much admired. Glycerine and albumen, Carron oil, Petroleum, Cosmoline, Collodion, cotton in thick layer, carbonated cotton, and the dry earth treatment have their advocates. Prick vesicles with fine needle. Cicatrices are serious and should be prevented if possible during treatment by resistant forces, such as adhesive strips, bandages, etc., etc. The contraction in cicatrices following burns and scalds is greater than that of any other cicatrices; deformities are excessive. Great care is required in burns near orifices; burns on the fingers should be carefully watched to prevent contraction. Operations on cicatrices, according to Dupuytren's three rules: 1st. *Wait* at least one year. 2d. Never operate unless certain of

obtaining larger cicatrix than previous one. 3d. Improper in anchylosis.

Effects of Cold are both constitutional and local. 1st. Irresistible desire to sleep, congestion of brain, surface pale and cold, pulse feeble, respiration almost imperceptible, pupils dilated, tetanic spasms At the siege of Corinth in 1862, few soldiers at the front suffered from frost bite, though the cold was severe, thermometer, 12°. At more remote parts of the lines, where fires were allowed, the men suffered seriously from frost bite. Alternation of temperature from cold to warm increases liability to frost bite; also damp and cold air.

2d. Effects of cold are divided into Pernio or Chilblain, and Frost Bite. *Pernio*, slight degree of inflammation from sudden alternations of temperature, atonic inflammation of the skin; delicate persons suffer in damp and cold weather by putting their feet to fires after coming in from the cold. Three degrees: 1st: Skin red in patches and swollen, burning, itching or tingling pain. 2d. Vesications, skin bluish and purple. 3d. Ulceration or sloughing, which is superficial, is often met with in this climate in winter; disappears in summer, returns again in early winter; appears in persons of weak digestion, having dyspepsia and imperfect circulation; attacks the nose, ears, toes, fingers and heels. Tingling, burning, and itching; vesicles form and contain a serous fluid, terminate in sores; difficult to cure.

Treatment.—Constitutional remedies are: *Agaric.*, *Canth.*, *Arn.*, *Ars.*, *Bell.*, *Camph.*, *Nux vom.*, *Rhus tox.*, *Puls*,, *Nit. ac.*, as indicated.

Particular indications.—*Bell.*, *Puls.*, *Kali c.*, for chilblains of a bluish appearance. *Cyc.*, *Lyc.*, and *Nux*, for bright red; if very painful; *Bell.*, *Puls.*, *Petrol.*; if inflamed, *Cham.*, *Ars.*, and *Puls.;* if ulcerated, *Ars.*, *Puls.*, *Carb. v.*, and *Petrol.;* if gangrenous, *Ars.* and *Lach.; Nit. ac.* when there exists much swelling and pain; *Rhus tox.*, burning and itching in the after part of the day, disposition to scratch, with blotches intervening.

Chilblains.—Bathe the feet or other parts in cool water, and rub with a coarse towel, hair glove or flesh brush; cosmoline applied externally; effects of stimulants are pernicious. Apply

Iodine applications: Iod., 1 part, Ether, 30, and Collodion, 100 by weight.

Frost Bite affects the nose, ears, toes, fingers and heels.

Symptoms.—1st. Affected part has a dull red color caused by deficient supply of arterial blood and stagnation in the veins. If cold continues, venous blood will be gradually expelled by tissue contractility; part feels stiff, livid color, numb and shrunken, sensibility and motion are lost; gangrene threatens. Frost bitten patient is unconscious, powers of life gradually cease, person grows feeble and languid inclining to sleep; becomes comatose and dies. Evil effects of stimulants in coma. Artificial respiration and friction, in severe cases.

Local Treatment.—Local friction of snow in Pernio; coma induced by cold, friction with flannel over the whole surface; put patient to bed in room of moderate temperature.

Treatment.—Internal Remedies—*Agar.*, *Arn.*, *Arsen.*, *Kali carb.*, *Nit. ac.*, *Nux vom.*, *Puls.*, *Rhus tox.*, *Petrol.*, *Zinc.*, *Sulph.*

Vesications: *Ars.*, *Lach.*, *Rhus. tox.*, *Carbo veg.* Chilblains returning with every cold change: *Petrol* or *Nitric acid.* Ulcerations: *Hepar*, *Merc.*, *Calc.*, *Calend.*, *Sil.* Chilblains on feet and hands: *Ant. c.*, *Zinc.*, *Sulph.*

Local Treatment.—Frozen feet to be warmed from *within* outward, support patients strength. In sphacelus, amputate above line of demarkation, in sound tissues.

In suspended animation from long exposure to cold, put the patient in cool room, friction, warm stimulating drinks.

SECTION I.

SPECIFIC FORMS OF INFLAMMATION.

Furunculus or Boil.—Furunculus is a hard red and circumscribed tumor, painful, ending in suppuration; inflammation of a sthenic type, blood vitiated, skin and areolar tissue involved, discharges thin, flaky lymph, areolar tissue disorganized and forms a core; appears often every spring, from high living in winter;

sometimes succeeds febrile diseases, then they are critical. Appears in young and vigorous persons with gastric and hepatic disorders; also induced by climatic changes, errors in diet, etc. When they appear in the spring, are multiple; if left to itself bursts at its apex; matter exudes; core remains; inflammation then abates; remove slough. They appear at the climacteric age; also caused by teething, pubescence, etc.

Treatment.—Correct system, poultice with: *Calc. mur.* two drams to two ounces of water.

Remedies are. *Arn.*, *Bell.*, *Sil.*, *Ars.*, *Cap.*, *Hydrast.*, *Hepar*, *Kali jod.*, *Picric Acid.*, *Chin.*, *Phytol*,, *Kali c.*, *Sulph.* Fill cavity with lint wet with Calend, retard when small, Nit. Argent. To eradicate predisposition, *Arn.*, *Berberis vulg.*, *Calc.*, *Lyc.*, *Nux.*, *Phos.*, *Mur. ac.*, *Sulph.* Large boils with excessive suppuration: *Hepar*, *Lyc.*, *Nit. ac.*, *Sil.*, *Phos.*, *Tart. emet.* Small ones: *Arn.*, *Bell.*, *Hepar*, *Picric ac.*, *Sulph.*, *Zinc.* When suppuration progresses slowly, *Hepar*; to abort suppuration, *Merc.*; Itching and burning, *Ant. c.*, *Carbo v.*, *Thuya.*; Stinging, *Lyc.*, and *Arn.* Hale recommends *Ascep.*, *Erigeron.*, *Graph.*, *Phy.*, *Iris. ver.*, *Stilling.*

SECTION II.

Anthrax, or Carbuncle, is of an asthenic type, and may be termed a malignant boil. It is rare in young people; occurs more frequently in the middle period of life, in the irritable and debilitated. It begins as a hard, dull red swelling, tender and painful; in a few days of increase it becomes a broad, flat tumor, doughy, and livid color, softening and suppuration takes place, giving exit to a thin ichor, and if pressure is made, a thick glutinous matter exudes; ulcerated apertures enlarge, with sloughing of the areolar tissue, indicating vitiated blood; is often attended with fever.

Pathology.—Inflammation of the radicals or prolongations of the sub-cutaneous areolar tissue dipping down into the deeper structures; the skeleton tissue. It varies in size from that of a half dollar to a dinner plate; occurs more frequently on the back,

nape of neck and nates; after hardness passes away, becomes soft and quaggy with a number of sinuses, which emit a thin discharge likened unto flour and water mixed.

Treatment.—1st. Remove constitutional faults. 2d. Favor suppurative process and restore healthy action. Give *Bry.*, *Ars.*, *Bell.*, *Rhus*, *Apis.*, *Anthracin.*, *Sil.*, *Lach.*, *China*, *Pyrola rotund.*, *Calc. mur.*, *Mur. ac.*, *Hyos.*, *Kreas.*

Special Indications.—**Ars.**—As a phophylactic in the beginning.

Ars.—Intense burning, a sensation as if boiling water was running beneath the integument; pulse small, irregular and frequent with cold sweats; persons of a nervous choleric temperament, who have suffered long emaciation, vomiting of fluids, burning thirst, or billious diarrhœa, fever, prostration, malignant cases.

Bell.—When cerebral symptoms appear, red face, shining eyes, and severe heat; tendency to erysipelatous inflammation; parts red and swollen.

China.—When asthenic symptoms are strongly marked; loss of blood or miasm influencing the disease; exhaustion; pyæmic symptoms.

Hyos.—In nervous or hysterical persons; coma, vigil or great restlessness; optical illusions; tumors; constriction of pharynx; itching of the part.

Lach.—Prostration with nervous and vascular erethism; parts look purplish with blebs here and there. (See creasote).

Mur. ac.—In scrofulous persons, with ulcers on the gums; feeling of emptiness in the stomach; frequent desire to urinate, profuse clear urine.

Rhus tox.—Burning and itching around the carbuncle, vertigo, stupor, pale face, frequent pulse.

Merc.—If disease is tardy; with considerable inflammation, followed by Hepar s.

Sil.—After suppuration has fairly set in.

Local Treatment.—Open and let out discharges. Paget opposes free incisions. Helmuth agrees; only incise sufficiently to remove slough; remove with forceps. Apply poultices of ground flax seed, or elm bark. charcoal or yeast, strips of cloth dipped in a solution of muriate of lime and applied constantly.

CHAPTER III.

INJURIES AND DISEASES OF ARTERIES.

Arteries are liable to inflammation, suppuration or ulceration, which may be *limited* or *diffuse*. In the former both its coats and the blood itself are altered; plasma is thrown out; the vessel loses its resiliency, becomes fragile, and a clot of decolorized fibrine is formed that occludes the vessel; *Embolism*. In the diffuse variety, the inflammatory action is more extended, but there is no plastic exudation.

Symptoms.—Local pain and tenderness extending along the artery which feels hard and tense, the parts it supplies may become cold and numb, and show signs of gangrene.

Periangioma is a peculiar disease affecting the outer coats of the vessels; is a new growth and forms a tumor on the scalp, in which the vessels are enlarged and ramify in the structure of the outer coat. (See part II, p. 191, affections of blood vessels).

Treatment.—*Ac., Ars., Bell., Carbo. veg., Gels., Sec., Dig., Lyc., Puls., Plumb., Sepia., Spig.*

Special Indications.—**Ars.**—In chronic arteritis, tenderness and pain in the large arteries, with plastic exudation; arseniate of antimony has been highly recommended in the lower triturations; gangrenous inflammation.

Aeon.—In the lower dilutions and frequently repeated has done good service in acute arteritis. *Dig* in arteritis threatening to terminate in atheromatous disorders

Phos.—In atheroma, with primary fatty degeneration; it retards calcareous degeneration of arteries. *Ammon brom.* to promote absorption of athermatous deposit.

Spig.—Pain in the large arteries of a chronic type, extending along the artery.

Kali hyd.—In arteritis with syphilitic or mercurial taints.

Plumb.—In atheroma, with general chronic endo-arteritis.

Secale.—In senile gangrene, involving arterial branches.

Verat. ver.—In recent arteritis to control arterial excitement, prevent atheromatous deposits. *Bell., Arn., Gels., Calc, Phos., Lyc., Nat., Sulph.*. may be consulted.

Atheroma is a degeneration of the coats of an artery and the formation of a soft, granular and pappy deposit within its coats, having its seat near the mouth of the larger vessels. This deposit gradually extends until large, irregular yellow colored patches of a cheesy consistence are formed. It sometimes is converted into a tough grayish membrane—steatomatous—gradually the middle coat becomes involved.

Calcareous degeneration is the final result of this process, in which calcareous material is deposited in the arterial coats, consisting of carbonate and phosphate of lime. This renders the tube brittle, is apt to give way and causes the severe and sometimes

fatal hemorrhage after surgical operations. This is a fruitful source of disease which in old age may cause death in many ways.

Embolism is the occluding of an artery by some foreign material. It may be produced by a dislodged atheromatous patch forced along the vessel and lodged near a bifurcation; a fibrous clot may be driven from the heart, or some foreign substance may lodge in a vessel and form a nucleus for a clot; it has occurred after fracture in puerperal women, and in endocarditis and is the cause of sudden death in such cases.

Symptoms—Severe pain at the point of occlusion; the part becomes swollen, blue and insensible, followed by gangrene. If the collateral circulation is active, mortification may be prevented; *hemiplegia* results and death follows.

Treatment.—Attention should be given to its predisposing and exciting causes. Study out the symptoms carefully, and prescribe understandingly either of the following: *Ca c., Graph., Con., Benzoic ac., Kali. jod., Lyc., Sil., Ergotine., Baryt., Sulph. ac.*

Surgical Treatment.—External heat, friction, position, electro-magnetism, and finally amputation. See gangrene.

Hemorrhage is of three kinds: ***Arterial, Venous*** and ***Capillary.*** In arterial, the blood *leaps* forth in bright red jets. In venous, it *wells* out in a dark purple stream. In capillary, it oozes from the general surface. It is also primary and secondary as regards the time after wounds are inflicted; if *immediate*, it is primary; if *subsequently*, secondary.

Arterial—*Natural arrest.*—When an artery is cut across, its coats *contract* upon itself, and ***retract*** within its sheath; caliber current is diminished, sheath retracts a little, forming a cylinder about the vessel which is filled by coagula, causing filaments of fibrine which adhere to the vessel's walls. This coagulum occludes the mouth of vessel; the slower the blood flows, the greater the quantity of coagula, and vice versa. The coagulum *within* the artery, (*bouchon*) is of a conical shape, with the apex upwards; that on the outside is called *couvercle.* Fibrine is also deposited on the lining membrane of the artery adjacent to the cut end; the arterial coats contracting, blend

together the two clots formed within the vessel, the *internal* coagulum, and the *secondary* internal clot; the fibrine becoming organized into fibro-cellular tissue leaves in a little while nothing but a fibrous cord, which permanently occludes the artery.

Torn Artery.—In case of a *torn* artery, the two *inner* coats yield to the force before the outer gives way. The outer coat is thus drawn to a point beyond the inner ones, which forms a double barrier to the flow of blood; first by the outer coat, and secondly by the sheath; a conical clot with its apex downwards forms in the space between the two inner and the outer coats, while in the artery itself, a conical clot forms with the apex upwards; subsequent changes occur as in the case of cut artery.

Wounded Artery.—In an artery *partially* divided, the blood poured out at the opening lodges in the sheath and adjacent tissues, coagulates and presses upon the artery reducing its calibre and altering its relative position to the wound, thus arresting hemorrhage; permanent closure takes place by adhesive inflammation in the wound itself.

Artificial Arrest.—*Hæmostatics* artificially employed are: position, cold, pressure by the fingers, compress or tourniquet, and secured by a nodose bandage. *Styptics*, these are *Monsell's salt, Local Anæsthesia, Alum, Rhatany, Matico., Erigeron, Cuprum sulph., Styptic Collodion,* Chloride of Iron and Cotton., Nit. Argent. †Benzoic acid and Alum.* Forced flexion, permanent compression, torsion, acupressure, circumclusion, torsoclusion and retroclusion, ligature and tourniquet.

Secondary Arterial Hemorrhage, or bleeding that occurs after it has been once stopped, may take place at various periods, that which comes on after an operation or accident, when the patient gets warm in bed and recovers from the shock imposed, is more properly called "reactionary hæmorrhage;" or it may take place from sloughs and the opening of vessels in the wound; this hemorrhage requires styptics, pressure, or the ligature. Bleeding may also come on after separation of the ligature around the artery, by ulceration and opening the vessel; in this,

*Boil the cotton one hour in weak solution of soda, 4 per cent.; wash in cold water and when dry, steep in liquid chloride of iron, ½ dilute water; press and dry in air.

†Benzoic, 1 part; sulph., alum and potassa, each 3 parts; ergotine, 3 parts; water, 24 parts. Boil and stir for one-half hour, replacing water evaporated. It is of a brown color when properly made.

CHAPER IV.

INJURIES OF THE SOFT STRUCTURES.

Shock is the result of a severe injury to the nervous system. It may be produced by certain diseased conditions without traumatism; called also prostration or collapse, and is divided into *primary* and *secondary* shock, in reference to the time intervening after injury.

Primary.—In *primary* shock, patient lies in a helpless, half unconscious state; pulse is quick, small and almost imperceptible; patient cold, faint and trembling; the surface is cold, shivering and covered with a clammy sweat; features are pinched; expression anxious; eyes vacant and partially glazed; breathing irregular and sighing with hiccough, perhaps vomiting which is favorable, and relaxation of the sphincters. These symptoms are sometimes accompanied with convulsions in children. The duration varies, depending upon nervous susceptibility, and extent of injury. In extreme cases death may occur; in milder cases, reaction comes on either naturally or artificially, with a gradual revivification of the ordinary functions of the nervous and vascular symptoms. As reaction advances, the pulsations of the heart increase, the pulse loses its "whirr," temperature increases, the skin loses its pallor; the eyes become more natural in expression, warmth is gradually diffused, respirations are long drawn, restlessness is developed, and fever sets in with all its concomitant symptoms.

Secondary Shock, produced by injuries, operations, etc., is not so marked in its characteristics as the primary; comes on insidiously, patient becomes weak, mind active, pulse moderately good, countenance dejected, skin sallow, functions of different organs impaired, suddenly a change takes place, and the patient falls into a condition similar to the active form. Different temperaments suffer in different degrees; this is especially noticeable in gun shot and railway injuries. Mental emotions, impaired constitutions, debauchery, advanced years, and excesses of all kinds act as predisposing causes producing shock.

Treatment is to ascertain the condition of the heart; if *simple*, encouragement, reassurance, a little stimulant, rest in the recumbent position, hot water to the epigastrium and to the extremities, and an extra blanket will suffice for restoration. In extreme cases where the heart ceases to perform its functions, *electricity*, with friction to extremities, and artificial respiration, stimulating enemas, warm applications, ammonia to the nose, and *veratrum* given internally by mouth or rectum will in almost every case restore the patient. *Ars.*, *Chin.*, *Hyperic.*, *Camph.*, *China*, *Opium*, *Dig.*, *Ammon. caust.*, *Carbo. veg.*, *Phos. ac.*, *Gels.*, *Bell.*, *Verat. vir.* *Ac.* may be employed after reaction has been established to moderate the same, and keep it within health limits. If stimulants are used in the stage of collapse, their effects must be carefully watched. If wound exists, it should be washed and treated in the ordinary way. In extreme cases recourse may be had to stimulating enemas, rubefacients, friction, or galvanism, to restore the shattered organism. *Ammonia* applied to the nostrils, if the patient is in a state of insensibility that precludes the use of medicines by the mouth. The remedies employed will be selected according to the following: *Veratrum* should be given internally, and I have used injections of this remedy into the rectum as auxillary means with success. After reaction is partially restored, *Arnica* should be given internally and applied locally to the injured part in the form of a lotion (Arnica 1 ounce, Aqua 9 ounces). If active inflammation sets in, *Ac.* becomes our chief reliance, and *Bell.* when internal congestion takes place. If great loss of blood attends the shock, *China* should be administered. If syncope threatens, *Ars.* is a valuable remedy.

Special Indications.—Arnica is one of the most reliable remedies in all forms of concussion following injuries, in complete stupefaction, muttering, low delirium, loss of sight and hearing, unconsciousness, in fact all cases when insensibility is not complete. It should be given every ten, fifteen, or twenty minutes, according to the severity of the shock until reaction has been completely established. In severe cases, it will prevent many of the evil consequences that may result, by its controlling influence over the cerebral vessels, and will prevent the extravasation of blood within the cavity of the cranium.

Veratrum is indicated in the more profound insensibilities and when Arnica has been tried without beneficial effects. It is especially indicated when there is coldness of the extremities, with pallor of the face and distortion of the features, relaxed muscles, tetanic spasms, imperceptible breathing, complete loss of consciousness. Eyes insensible to light, cold sweat on the face and extremities, hippocratic countenance.

Opium is beneficial in restoring the reactive power of the organism and is especially indicated in a comatose condition, accompanied with stertorous breathing; red, bloated face, with frequent quiverings of the lips, full, slow pulse; with profuse, *warm* sweat, unconscious; with eyes half-closed and glassy.

Camphor.—This remedy, says Prof. J. C. Morgan, has done me good service in shock of injury, giving relief in a few minutes. After sudden injury, body cold and clammy; face, bluish and pale; lips livid and pulse feeble; respiration slow and sighing: stupefaction.

Ammon Caust.—When tissues of organic life were specially and severely involved, has also done good service. *Capsicum Calamus*, *Cuprum digitalis* and *Phosphorus*, *Nux moschata*, *Strentian* and *Carbo. veg.* may be consulted in addition to those above named.

Carbo. veg.—Stupor hardly yielding to stimulants; colliquative diarrhœa; cold sweats; rattling breathing; stagnant circulation; frequent, filiform pulse.

Belladon.—The active principle of this remedy has been employed from time to time in collapse, by Dr. Hodgen, of St. Louis, who employed it in doses of 1-60 to 1-30 of a grain dissolved in water and deposited under the skin by means of a **hypodermic** syringe. Dr. Weber has quite recently employed Bell. for the same purpose and highly endorses its therapeutic value both in shock and collapse.

China.—Prostration of the vital forces after hemorrhages or exhausting discharges; systemic complications; pale and bloated face; digestive derangements; emaciation and gradual prostration.

Hypericum perf.—Of the virtues of this remedy in shock, Dr. T. L. Brown, of Binghampton, Vt., thus writes: "Of Hypericum perf. I can speak with enthusiasm. The use of it was first suggested to me by Dr. Lippe, and since that time a single dose of the 200 potency has never failed to give almost instantaneous relief to the pain resulting from the injury of parts rich in nerves." Shuddering all over, lacerated and torn wounds; when nervous tissues are most concerned; scalp wounds, and in richly endowed ne vous parts.

Stimulants.—The propriety of giving alcoholic stimulants in shock is a matter much discussed by different surgeons. It used to be the practice to administer stimulants in all degrees and conditions of shock, but I think the more conservative spirit of the age and the occasional serious results that have followed its use, have to a large extent opposed its general employment. In my observations, both in civil and army life, I have seen much evil follow its indiscriminate use and I am equally sure that the remedies recommended above are amply sufficient for all conditions incident to shock.

SECTION I.

WOUNDS IN GENERAL.

Special Wounds are divided into *incised*, *lacerated*, *contused*, *punctured*, *penetrating*, *poisoned*, and *gun shot*.

Incised are inflicted by a sharp cutting instrument, and is the simplest of all the varieties. They present clean cut surfaces, favorable for immediate union, or union by the first intention. The chief danger is from hemorrhage. They are *simple* when they implicate integument and muscle, and *complicated* with injury of the larger vessels or nerves, or of important organs.

Treatment.—When the flow of blood has ceased, the wound should be freed from all extraneous matter, the edges brought into perfect apposition, and if simple, held in situ by small strips of plaster, a film of collodion, or a pledget wetted with Hyperic lotion and a roller over all. If the wound is deep, the edges shrould be drawn together by deep sutures, the invaginated bandage, or strips of adhesive plaster dove-tailed together, having the broad surface applied to either side of the wound. The single attached ends pass by each other; the edges of the wound are brought together; the firmness of the apposition may be secured by a silver wire or whale tendon suture or two, which do not antagonize union by adhesion. Hemorrhage depends upon the vascularity of the part; the separation being due to tension and vital contractility The *serrafine* is appropriate when very

accurate union is required as in cuts about the face. If sutures are required, the silver wire, the antiseptic cat gut, or the whale tendon are preferable. Needles and the figure of 8, the quilled sutures, the continuous or the interrupted suture may be employed according to circumstances. The dry suture of Dr. Packard for wounds about the face is valuable. This is made of two wide strips of adhesive plaster applied to either side of the wound and the edges sewed together instead of the skin. Due attention should be given to constitutional treatment and the removal of all sources of irritation from the system. Here *Ac.* will accomplish a great object. (See the article on Hemorrhage). Locally apply Hypericum or Staphysagria lotion. For hemorrhage following wounds see page 42.

Lacerated Wounds are torn rather than cut and are inflicted by blunt edged instruments. There is no fear of hemorrhage, as torn vessels soon cease to bleed. In all lacerated wounds, the vitality of the parts injured are more or less impaired by the contusion. This produces sloughing; suppuration is in progress and union by primary adhesion is impossible. The extent of sloughing will depend upon the amount of contusion and the nature of the structure injured. The face, hands, scalp, and other highly vascular parts are less prone to slough than parts less vitalized. Erysipelas, gangrene and tetanus are prone to occur after lacerations.

Treatment is to cleanse the part, to replace the two opposing surfaces as accurately as possible; this may be effected by the same process mentioned in incised wounds. Employ no sutures except the carbolized cat gut, the whale tendon or the silver wire, and as few of these as possible; maintain replacement by adhesive strips, and by all means apply warm pledgets of *Hypericum* lotion, which I have proved to be as curative in lacerated wounds, as Calendula is in suppurating surfaces. In fact I have seen the most remarkable and prompt curative effects follow the use of this remedy. If erysipelas occurs the remedies for that condition must be employed immediately. They are *Ac.*, *Apis.*, *Arn.*, *Bell.*, *Canth.*, *Rhus.* If high fever, *Ac.* If gangrene, *Ars.*, *Lach.*, and *Chin.* If ligaments are injured, *Rhus.*, *Ruta.*, and *Rhodod.* For periostial trouble, *Mez.*, *Phos. ac.*, *Ruta.*, and *Rhodod.* See hemorrhage, page 40.

Contused Wounds are when bruising and pulpification of the parts are the most prominent characteristics, without rupture of the integument—when the tissues are broken it constitutes a lacerated wound. There is ecchymosis, effusion of blood and serum into the subjacent tissues by laceration of their coats, with a tendency to ulceration, sloughing and gangrene, in cachetic constitutions; secondary hemorrhage is liable to occur.

Treatment is to prevent further infiltration into the tissues and to promote absorption of the fluids already escaped. Here *Arn.* is the great specific and is worth all other remedies put together. It should be applied *warm* and be frequently renewed. Complications must be met as they arise, by appropriate remedies.

Punctured Wounds are those made by a sharp pointed instrument, and are deep as compared with their surface extent; are dangerous because of the injury inflicted upon important structures beneath. It was formerly the custom to convert all punctured wounds into incised ones. The pain is severe through nerve lesion and the bruised condition of the tissues. The most frequent and severe punctured wounds are made by pins, needles, nails, thorns, splinters, etc. Needles penetrate easily and advance rapidly, and no operation should be performed for their removal till the surgeon is positive of its exact presence ,then make a free incision over it and remove with fine forceps. In punctured wounds where a considerable artery has been divided, or where a portion of the weapon remains in the wound, the original wound may be enlarged, the artery tied and the weapon removed.

Treatment.—Tetanus and erysipelas are prone to follow this injury and should be carefully guarded against till after the ninth day. If any lodgment of weapon, pieces of clothes, or other foreign substance lie imbedded deep in the tissues, they must be removed *first*, then check hemorrhage, moderate inflammation and prevent the development of nervous symptoms. The wound ordinarily may be approximated by *pads* and *bandages* throughout its whole extent, so as to secure if possible union by adhesive inflammation. In earlier times "suckers" were used to draw out the extravasated blood; a small drainage tube may be often employed. Antiseptic lotions are sometimes called for. In case

of hemorrhage and systemic implications see hemorrhage page 40. *Ledum* internally and externally is the remedy par excellence. Apply it locally by means of a pledget and roller. Meet other indications as they develop. If wound does not heal by adhesion, heal from bottom and keep wound open.

Poisoned Wounds are those produced by certain noxious irritating matters introduced into the system. They may be incised, lacerated or punctured, and their essential character is the poisonous material introduced into the blood, through which the whole system may be involved even to the production of death.

Characteristics.—The constitutional effects in severe cases from serpent bites, are delirium, violent inflammation, erysipelas, followed by ulceration and sloughing; pain at part bitten is burning, and tingling, accompanied by a brief spasm, with rapid swelling, diffuse inflammation, gangrene and death. The constitutional symptoms are great depression, nervous prostration, feeble and intermittent pulse, dilated pupils, delirium, stupor and insensibility; less severe cases develop tardily and there is a vesicle and sore; prognosis should be guarded.

Treatment.—First, to prevent absorption, and second, to ward off fatal nervous depression. For the first, a ligature around the limb above the seat of injury, incisions, dry cups, suction, caustics, and evaporating lotions. For the second, stimulation (alcoholic), ammonia or olive oil internally; poultices of tobacco, plantain and hoarhound locally. The indicated remedies are *Ars.*, *Bell.*, *Carbo. veg.*, *Lach.*, *Merc.*, *Senega.*, **Bibron's antidote*, *Hypodermic injections* of ammonia and liquor potassæ into the veins; radiating heat to the part is highly lauded by Dr. Hering.

Hydrophobia—Rabies-Canina is produced by the poisonous bite of the dog, wolf, fox, and other animals. Occurs under two forms: one in which the animal shows unusual activity. 2d. Unusual depression. It is said that the skunk produces hydrophobia even when not rabid. The virus has a period of incubation; most dangerous on the exposed parts of the body; clothing often prevents its effects.

*Bibron's Antidote.—Kali jod. (crude) 4 gr.; Merc. cor., (crude) 1 gr.; and Bromium, 8 scruples; dose, 5 to 10 drops.

Symptoms.—Giddiness; chills; flashes of heat and general discomfort which increases to extreme nervous irritability; great sensitiveness to drafts of air; apprehension and convulsions; spasm of muscles of deglutition and respiration; extreme sensibility of all the senses; excessive mental agitation and terror; pulse 130 to 150.

Local Premonitory Symptoms are painfulness, irritability, and discoloration of wound; if healed, it often opens and discharges unhealthy matter; pain extending from the wound along the nerves; the bitten part feels numb, stiff, and becomes immovable.

Treatment.—Prophylactic measures are, excision and cauterization. Give internally *Hydrophob.*, *Lach.*, *Bell.*, *Canth.*, and *Elecampagne.* The curative remedies are: *Bell.*, *Hyos.*, *Hydrophob.*, *Lach.*, *Canth.*, *Stram.*, *Cuprum.*, *Hyperic.*, *Lobelia.*, *Scutel.*, *Bibron's antidote;* and the mad stone externally applied.

Dissecting Wounds often give rise to the most serious and fatal consequences; impaired constitutions suffer most. Matter inocculated from a recently dead body is much more dangerous than from a decomposed one,—on this account, wounds received in the dead-house are more serious than those received in the dissecting room. Persons who have died of erysipelas, pyæmia, peritonitis, syphilis, and puerperal fever are most poisonous. Surgeons are apt to be poisoned during operations. Treatment same as recommended in poisoned wounds.

General Indications.— *Wounds.*—Remedies for the various wounds and their special indications. Contusions, *Arn.*, *Con.*, *Euphras.*, *Iod.*, *Ruta*, *Rhus tox.* Sprains, *Agnus c.*, *Arn.*, *Ammon.*, *Bry.*, *Con.*, *Cic.*, *Rhus.* Incised, *Hyperic*, *Staph.* Lacerated, *Hyperic.*, *Opium*, *Con.*, and *Cicuta.* Punctured, *Apis. m.*, *Ledum.*, *Cicuta.* Ecchymosis, *Bry.*, *Calend.*, *Rhus*, *Sulph. ac.* Poisoned, *Ammon.*, *Ars.*, *Bell.*, *Caust.*, *Lach.*, *Led.*, *Nat. mur.*, *Senega.*

Special Indications.—Agnus c.—Strains from lifting great weights, twisting of joints, sub-luxations; pain not severe in the beginning.

Arn.—Bad effects locally from falls, twists, strains, bruises and all mechanical injuries when the skin is not broken.

Ammon c.—Sprains followed by weakness and soreness in limbs, as if bruised, drawing and tension in joints, contraction of limbs as if tendons were too short.

Apis m.—Septic wounds, with throbbing, and pulsating pain extending up the limb; erysipelas following wounds. Punctured wounds, stings of insects: skin sensitive to touch, attended with debility and exhaustion.

Calend.—Open wounds followed by bloody and serous infiltration into the cellular tissue; threatening suppuration.

Conium.—Contusion with thickening of the cellular tissue and induration of glands, accompanied by a sensation of numbness.

Hyperic.—Great nervous depression after wounds; injuries to parts rich in sentient

nerves, especially the scalp, palms of hands, soles of feet, matrices of nails; lacerations, severe pains showing injury to nerve structure.

Ledum.—Deep wounds made by sharp instruments; punctured wounds which feel cold to touch; chilly sensation during fever. *Mez.*, for callus following wounds.

Rhus tox.—Bad effects from strains, especially membranous structures and ligaments, and thecæ of tendons.

Ruta.—Injuries of periosteum and ligaments, tarsal and carpal joints. (*Ledum.*)

Staph.—Injuries from sharp cutting instruments—incised wounds.

Symph.—Injuries affecting bones, with contusion and fracture.

Gun Shot Wounds are both contused and lacerated, and include all those which are caused by the discharge of firearms. Bleeding is comparatively slight unless a main artery is divided; and is immediate or *primary*, or consecutive or *secondary*. Shock follows every serious wound. Orifice of entrance is small; of exit large. Wounds made by conical balls from rifled weapons, are more dangerous than those from round shot. Windage from balls is not fatal as was once supposed.

Course of Balls.—Balls frequently lie embedded or encysted for life. A round ball is more readily deflected from its course than the rifle ball, and is more apt to be encysted. The rifle bullet inflicts the most severe and dangerous wounds; it splinters bones, penetrates nerves and tendons, and tears its way through every structure it meets. *Round balls occasionally follow the most devious courses. Irregular missles of all sorts make ghastly and dangerous wounds; portions of dress, accoutrements, etc., are apt to be driven into the wound. This kind of wound ejects the substance driven into the body by its own suppuration. Gunshot fracture of bones is *simple*, *compound* and *complicated*; a ball lodged within bone gives rise to prolonged inflammation and necrosis, followed by hemorrhage, abscess, gangrene, erysipelas, pyæmia, necrosis, non-union and tetanus. Bone perforated by a ball does not produce such severe consequences; pain and hemorrhage are the prominent characteristics of gun shot wounds.

Local Treatment.—Gun shot wounds are to be treated on the same general principles as contused and lacerated wounds. The object is to arrest hemorrhage, remove foreign bodies, replace tissues, put the part in the most favorable position for union by granulation or to hasten the separation of sloughs. Wounds should not be enlarged unless to tie a bleeding vessel, remove foreign bodies, and all extraneous matter. The bullet

*I saw one case in which a ball entered at the nape of the neck and was cut out at the extremity of the sacrum, traversing the whole extent of the spine, leaving a bright red line under the skin to show its devious track. This case was treated by the author at Mound City General Hospital.

forceps, or other suitable instrument should be employed to remove balls or other objects driven within the body. After wound has been cleansed and all operative procedure finished, apply *Hyper.* lotion, which has been more successful in my hands than all other remedies combined. Whenever suppuration begins, use *Calend* lotion; *Carbolic acid* for disinfection, etc., etc.

Constitutional Treatment.—Rally patient from shock (see Shock); stimulants are injurious in gun shot or penetrating wounds. Allay fever by *Ac.*, *Gels.*, *Bap.*, *Verat.*, *China*, etc. Support strength during suppurative period by appropriate remedies, diet, etc.

Gun Shot Wounds of the Chest.—If a ball penetrate the chest or lodge within its cavity, it may become encysted and give rise to no more trouble. When the lung has been wounded, great collapse ensues approaching to syncope; face is pale and anxious; breathing difficult, often expectoration of frothy blood and emphysematous condition of the wound.

Treatment.—Give remedies for hemorrhage, (which see) and treat case as a penetrating and lacerated wound. Put patient at rest, with low diet, cooling drinks; allay fever by giving *Ac.*, *Gels.*, *Bap.*, *Verat.*, and prevent suppuration, *Merc.*; or, if begun, moderate by appropriate remedies: *Hepar*, *Calend.*, etc., and apply continuously lotions of *Hyperic.*, or *Ledum.*, in accordance with their curative action. Probe cautiously if at all. Great danger often follows this meddlesome surgery.

Gun Shot Wounds of the Abdomen are usually fatal, producing septicæmia and peritonitis with their consequent complications. If the viscera escape injury, peritonitis is apt to follow if it is much injured; if the liver, kidney, stomach, spleen or large intestine is involved, the risk to life is greatly increased. The case of our late lamented President Garfield is a melancholy example of the evil effects following hyper-medication in this variety of gun shot; under a more conservative course by his surgeons or if proper homœopathic remedies had been employed, the case might have terminated differently. I speak from experience.

Symptoms are great collapse, pain, vomiting, peritonitis, perhaps death, which follow the wound. Protrusion of the intestines rarely happen unless the wound is of considerable extent.

Treatment.—The wound should be carefully and gently examined during the state of nervous depression, unless collapse threatens immediate death. If the intestine is only slightly wounded it is better to depend upon union by adhesion and lymph deposit, than to use a ligature. If the laceration is more extensive the continuous suture—Lembert's—the carbolized gut, or whale tendon, should be used, and the bowel returned; or attach it to the edges of the external wound by interrupted suture and convert it into a fæcal fistula. Keep patient quiet and on low diet. Apply locally, lotions of *Hyperic* or *Ledum*, and give such remedies as will respond to the condition represented.

Amputation after Gun Shot.—The following rules should be observed in all gun shot injuries of the limbs. Amputation is recommended: 1st. When a limb has been almost dissevered from the body. 2d. When the limb has been crushed and pulpefied to disorganization. 3d. When a large mass of soft structures has been torn away, involving lesion of important vessels, and nerves. 4th. When the larger joints have been opened, the bones comminuted and important vessels torn. Every amputation should be made as far as possible from the trunk. The farther, the less mortality, and vice versa. In all gun shot injuries to the smaller joints and in continuity of the bones of limbs, excision is preferred to amputation. If possible amputate during nature's anæsthesia (primary). My experience in army and civil life, leads me to recommend *primary* always in preference to *secondary* amputation, or those performed after fever has been established, (vide "Homœopathy in the Army,") N. Y., J. H., 1864.

Equinia is a disease generated in the horse tribe and transmitted to man by inocculation. It manifests itself under two forms, *glanders* and *farcy*, and is conveyed to man through abrasion of surface, or by mere contact with the skin or mucous membrane.

Glanders is an affection of the mucous lining of the nose, followed by an offensive discharge, mixed with blood and terminating in sloughing of the internal structures, coincident therewith. The salivary glands and the cervical lymphatics become swollen, hard, painful, and prone to suppuration.

Farcy is that condition wherein the subcutaneous glands

throughout the body become hard and painful, constituting what are termed "farcy buds."

Pathology.—These diseases are supposed to be due to the deposit of a material analogous to tubercle, involving the schneiderian membrane. This is further proven by the fact that consolidation of the lungs ensue with circumscribed patches of pneumonia.

Treatment.—If acute, it is a very serious disease, if chronic, with proper treatment it is almost certain to be cured. The appropriate remedies are *Crotalus*, *Graph.*, *Kali bi.*, *Merc.*, *Lach.*, *Rhus tox.* Great attention should be given to diet, cleanliness, ventilation and disinfection, while the pustules and sloughs should be treated locally by lotions of *Calend.* *Arsenic*, *Kali bi.*, *chrom.*, or *Hydrocotyle.* See septicæmia.

CHAPTER V.

VENEREAL DISEASES.

Venereal Diseases.—Under this term is included all the diseases that arise from impure coitus, viz: *Gonorrhœa*, *Chancroid*, and *Syphilis.*

Gonorrhœa is the term applied to a specific inflammation of the urethra, or vagina; the result of impure sexual intercourse, and accompanied by a purulent discharge. After exposure to infection, an uncertain period lapses before the symptoms are developed, called the *period of incubation*, and which lasts from four to seven days. The disease is divided into three stages, each having distinctive peculiarities, viz: *accession*, *acute inflammation*, and *decline.*

Accession.—1*st Stage.*—In the male, the disease comes on with gentle heat and irritation; a sense of tickling or slight itching within the meatus. The glans become congested, the lining membrane is red, swollen, and the orifice partly closed, and there is emitted a thin, whitish, watery discharge, while the urine is passed with difficulty, and the stream is diminished,

twisted and forked. Accompaning these symptoms there is a dull, aching pain in the back, loins and testicles, with more or less pyrexia.

Acute Inflammation.—2*d Stage*.—In this stage all the symptoms are aggravated; the discharge becomes thick, puriform, and perhaps of a greenish or redish tinge, with prolonged and painful erection at night. Pain and scalding in passing urine, which is more frequent. The penis is often curved as if tied down with a string (chordee), which is due to deposit of lymph in the corpus spongiosum. which interferes with the uniform expansion of the organ, and is exquisitely painful. At times the prepuce is œdematous which may give rise to phymosis or paraphymosis. Abscess may form in the substance of the penis causing much pain and trouble, or a metastasis may take place to the testicle, producing orchitis. The lymphatic glands in the groin may become inflamed and suppurate (bubo), or, at the termination of this stage there may occur rheumatic pains of an exceedingly obstinate kind; in the larger joints it is called gonorrhœal rheumatism.

Decline.—3*d Stage*.—When the inflammation has run its course and is on the decline, there follows a thin, muco-purulent discharge (gleet), which may continue for some time and become very inimical to treatment (incipient stricture).

Urethritis or Blennorrhagia.—There is a form of disease resembling gonorrhœa, but which is not produced by a specific virus. This disease may be caused by external violence, the use of instruments, masturbation, excessive coitus, and by accidental causes; each case wanting the direct contagion. This disease is less violent than the preceding, cannot be generated by auto-inoculation, and is more amenable to treatment than gonorrhœa. Great caution should be exercised in discriminating between these diseases, and when in doubt inoculation should be performed and a correct diagnosis arrived at. A preponderance of cases of urethral inflammation are of this type of disease, which are produced by the causes assigned. As a rule the *first* attack of urethral inflammation, is more *violent* than subsequent attacks.

Treatment is both *prophylactic* and *curative*. The difficulty in employing the first is that the physician does not see the

patient till too late to use the abortive treatment, which should only be done in the "accession" period. This is accomplished by injecting into the urethra, *never beyond the inflammatory portion* which is about the fossa navicularis, a weak solution of *Nitrate of Silver, Sulphate of Zincum*, or *Cuprum*; one grain of the *Nitrate* in three ounces of distilled water, or three grains of either *Zincum* or *Cuprum* in same amount of water, and add six grains of *Gum Arabic* to each mixture.

The following recipes are highly recommended as prophylactic agents, and should be used warm.

℞. Merc. corros., (*cr.*) gr. i; Aqua Rosæ, ℥ viii.

℞. Acid Nitric, (*cr.*) gtt. iii to vi; Aqua bullæ, ℥ viii.

℞. Nux Vomica, (*tr.*) gtt. xx; Aqua Rosæ, ℥ iv.

℞. Cannabis sat., (*tr.*) gtt. xii; Aqua bullæ, ℥ vi.

℞. Eryngium aq., (*tr.*) gtt. xii; Aqua bullæ, ℥ viii.

℞. Gelsim, (*tr.*) gtt. xii; Aqua bullæ, ℥ viii.

This should be employed with rigid regularity every four hours till all the primary inflammation is destroyed. The patient should void urine just previous to the injection, or the urethra be washed with warm water. If the injection of silver (my favorite remedy) passes away loaded with a pearly looking discharge, it must be repeated till it comes away unmixed with any of this peculiar product. After each injection, the discharge will be increased for an hour or two, when it becomes gradually thinner and less copious; two or three days are ample for a perfect cure if strict attention is given to the details of the operation, hygenic treatment, etc. Injections should never be employed stronger than the above, and never during the inflammatory stage.

The medical treatment consists in the use of the following remedies: *Sepia* in the *accession* stage; *Ac.*, *Gels.* and *Merc.* in the *inflammatory* period; to be followed by *Can. sat.*, *Merc. sol.* and *Cor*, *Canth.*, *Copaib.*, *Santal*, *Petros.*, *Caps.*, *Sepia.*, *Ercth.*, *Erig.*, *Eucalyp.*, *Agnus cast.*

Special Indications.—Sepia.—This remedy given in the higher potencies is one of our most valuable agents for the cure of Urethretis in the stage of accession and I have made numberless cures with it. It corresponds faithfully to the *tingling, smarting*, and *titillation*, itching of the prepuce and discharge of milky fluid and whenever I could hold my patient well in hand, have rarely required any other remedy. It corresponds with the urging, frequent, painful micturition, mucous discharge, smarting, tenesmus and bearing down sensation about the perineum.

Gels.—This is a precious remedy in all cases of urethritis and gonorrhœa when the symptoms are sub-acute, discharge moderate, frequent irritation with considerable heat,

and little pain with smarting and redness at the meatus. In sub-acute cases or in severe cases when the inflammatory symptoms have been subdued by previous treatment.

Acon.—In acute gonorrhœa, inflammation well-developed, even scalding, copious, thick greenish discharge; frequent and painful erections with more or less febrile disturbance; lips of the meatus red and swollen. After inflammatory symptoms have subsided, give *Can. sat.* for smarting pain, burning and stinging during micturition, ardor urinæ, constant urging, titillation, copious, thinner, yellow or whitish discharge, the lips of the meatus glued together and retaining the matter within, prepuce swollen and painful, with burning, smarting, stitching, darting pain in the urethra, extending from the orifice of the penis to the bladder; strangury, with pains extending to the scrotum, with dragging of the testicles.

Merc.cor.—Another valuable agent in the acute stage with thick green and bloody discharge, painful erections, swollen prepuce, constant desire to urinate, muco-purulent matter mixed with blood, cutting pains in the urethra, swelling and burning of the prepuce, lips of the meatus red and œdematous, drawing pains in the testicles with swelling of the glands—chordee, stream of urine smaller and passes away feebly. *Merc. sol.* acts well in cachetic and impaired constitutions, in sub-acute cases especially after *Acon*; discharge slight, itching and stinging pains mostly confined to the glans.

Copaib.—When the inflammatory symptoms have been mitigated by *acon* or previous treatment, or in sub-acute cases with itching, smarting and burning in the urethra with nocturnal chordee; urine emitted in drops, swelling and redness of the urethra, urging pressure, pulsative pains along the urethra, the urine has the odor of violets, with a constant desire for its voidance, discharge yellow and copious, the urine depositing a sediment resembling albumen, a peculiar *erythema* with sub-acute synovitis, has frequently occurred in my practice from its use in the crude form.

Oleum Sandalum has of late done me good service in cases of this often intractable disorder, after the use of Acon. for 24 or 36 hours, when the discharge is thick, yellowish, or muco-purulent, attended with burning, smarting pain, frequent desire to urinate, swelling and redness of the meatus, with smarting, stinging pain in voiding urine; painful erections, swelling of the prepuce as if distended with water. I have used it in the first and second potencies with the most satisfactory results. I prefer the latter—after amelioration by the second, the third acts even more satisfactorily.

Petrosel is another new remedy, and like the former is most appropriate when the more violent symptoms have been controlled by *Acon.* or other appropriate treatment—especially in cases where the inflammation has passed up the urethra, rapidly involving the base of the bladder with distressing ardor urinæ with strangury, discharge profuse, thick and whitish—see Canth and Capsic.

Canth.—Cutting, stinging pain during and after micturition, discharge thick and yelloiw, with severe pains at the base of the bladder, continuing before and after urinating, with ardor urinæ. (Consult Capsic.)

Cubeba.—This is a remedy too much overlooked in those chronic, sub-acute or gleety conditions of the genito-urinary tract and in the blennorrhagias that occur in relaxed or impaired constitutions, especially after frequent attacks of the urethritis with an absence of the more violent symptoms.

Meser.—In mild cases with stinging, titillating pains, beginning at the bladder, and extending to the meatus, discharge thin and yellowish, soreness along the urethra after voiding urine, which is acrid and red, like blood.

Terebinth.—In sub-acute and chronic blennorrhœas, with burning during urination, suppression of urine, urethra sore, discharge whitish, unsuccessful attempts at micturition, irritation extending from the bladder to the meatus.

Kali hyd.—In chronic urethritis of long standing with constant urging to urinate, with thick, green mucous discharge, pain during micturition, irritable and sensitive urethra.

Erigeron can.—In chronic blennorrhœas with irritation of the urethra with increase of offensive urine, drawing pain in the back running down to right testicle.

Stilling. has been given in chordee with painful erections, burning and itching during the act of micturition, irritation extending to the bladder.

Thuya.—In chronic and ill-treated cases, with burning in the urethra, stitching pain at the meatus between the acts of micturition, sensation of titillation as if a drop of urine was passing along the urethra.

Sulph.—In chronic gonorrhœa when the discharge is slight, but the smarting and burning continues during urination, urine passes in a thin stream, walls of the urethra thickened, itching along the urethra with constant desire to void the urine; pain, stinging and tearing between the acts of micturition; when the appropriate remedy seems to have lost its curative action.

Dr. Price, of Baltimore, advises, as soon as the *first* drop appears, to inject a few drops of clear glycerine, enough to fill the urethra as far back as the inflammation extends; hold it there for five minutes, then let it escape; urinate before using. Another plan is to wrap a piece of raw cotton around Emmett's silver probe saturated with glycerine; pass it into the urethra an inch or more, repeat if necessary. These prophylactic measures may be tried I think, with fair success.

My experience has led me, after many years of practice, and large numbers of patients treated, to resort to the medium potencies, when the best directed efforts with the crude and lower attenuations effected little or no good. A resort to the middle and higher potencies, as high as the 30th has almost always resulted in marked improvement and speedy cures. I can confidently recommend their employment when both physician and patient are wandering about in the maze of unrelief.

During treatment, patient must abstain from all stimulants, condiments, strong coffee and tea, and tobacco in every form; quiet and rest should be enjoined, and the strictest cleanliness be observed. In such cases, when a "drop or two" still appears after a well conducted course of treatment, suspect incipient stricture and use mechanical dilatation. Some authors speak of a kind of inflammation of this character which they term "gonorrhœa sicca," or dry clap. I do not attach any importance to this as a variety of gonorrhœa. Use suspensory bandage to the scrotum if the patient will attend to business. Sexual excitement should not be permitted, and all hygienic precautions enforced during treatment and two weeks after, for fear of a relapse.

Orchitis is an inflammation of the testis proper. When the Epididymis is involved it is termed *Epididymitis*. In a badly managed gonorrhœa, both structures may be involved, especially so after exposure to cold or strong caustic injections. When it occurs coincident with gonorrhœa there is a temporary cessation of the discharge; the disease by metastasis attacking the testicle. The symptoms are weight and tenderness in the peri - neum; pain in the back and loins extending from the scrotum; testicle swollen; skin covering scrotum tense, dark red or purplish; tenderness to touch; with fever; furred tongue; dry skin. This may terminate in abscess, with an increase of all of the above symptoms, with a feeling of pulsation and pain deep in the organ; shiverings are present, and even the pressure of the bed clothes is insupportable. The pus is mostly ill-conditioned; fluctuation is felt, and if left alone, the abscess will be discharged by several openings and a peculiar *fungous growth* springs out from these outlets.

Treatment.—Remedies act exceedingly prompt in this affec-

tion. In mild cases a few doses of *Sulph.* will restore the urethral discharge and allay all inflammatory trouble connected with the testicle. In plethoric persons *Ac.* and *Bell.* are very servicable. *Gels.*, *Puls.*, *Phytol.*, *Clem.*, *Ham.*, *Merc.*, *Rhod.*, *Ant. tart.*, *Verat. vir.*, *Spong.*, *Hepar.*, will be found competent to cure the worst cases. After inflammation has passed, use adhesive straps and the suspensory bandage.

Special Indications.—**Ac.**—If there is fever, hot and dry skin, full pulse and other active indications of vascular excitement.

Gels.—When the disease arises from a suppressed gonorrhœal discharge, from exposure to cold or wet weather, or when biliary disorders exist with tendency to congestion.

Clemat. erect.—After activity of the inflammatory conditions have subsided. If the disease began in the epididymis or if it assumes a chronic type with induration and sensitive prepuce; retraction of the testicles and cord; coming on after exposure to cold. (See Aurum).

Bell.—If the organ is hot and swollen, in plethoric persons, with tendency to delirium and congestion to the head.

Puls.—Is servicable in persons of mild disposition, easily affected to tears; delicate organizations. When the inflammation is sub acute, the glands alone being affected, pain shooting down the back, or into the thigh, and changing suddenly with little or no thirst during the fever.

Ham.—Dull, heavy pain in testicle, at times excruciating; unconscious seminal losses; scrotum hot, congested and swollen, the covering having lost its corrugated appearance and becoming tense, smooth and shining. (See *Bell*).

Hepar s.—For abscess of the testicle fully formed; after pus is formed evacuate with bistoury or aspirator; close wound with a piece of adhesive plaster; *Sil.* and *Phos.* may be required to complete the cure.

Merc.—After subsidence of inflammation, and the formation of pus threatens, with shivering and profuse perspiration; the gland hard and sensitive. If testicle continues hard, *Iodium*. The scrotum should be well supported on a small pillow placed between the thighs. Apply locally *Ac.*, *Bell.*, *Clemat.*, *Puls.*, *Ham.*, lotions to scrotum; low diet and rest in the recumbent position; strapping of the testicle.

In rheumatic orchitis, *Ac.*, *Gels.*, *Bell.*, and *Merc.*, in the lower attenuations, have done good service in my hands.

Balanitis, or spurious gonorrhœa, is caused by impure coitus, or a want of cleanliness about the glans penis and is accompanied with itching, burning, and soreness under the prepuce, increased by walking. The inflammation may be very severe, with œdema of the prepuce and phymosis, and become very distressing, yielding a muco-purulent discharge. It frequently arises from the sebaceous glands around the corona, which secrete a cheesy kind of matter; this becoming disorganized, produces an inflammation which envelops the lining membrane of the glans and gives rise to excoriation and swelling of the prepuce.

Posthitis.—It is called *posthitis* when the inflammation extends to the lining membrane of the prepuce. Causes.—Want of cleanliness, leucorrhœa, menstrual secretions, violent coition, as well as contagion.

Treatment is cleanliness and lotions of *Hydrast* or *Calend.* If the swelling of the prepuce is so tense as to prevent preputial retraction over the glans, cleanse with a small syringe, its nozzle being introduced within the aperture of the prepuce, and the lotion applied three or four times a day. When the prepuce can be retracted, apply *Calend.* or *Hydrast. cerate* to the part or sprinkle the abraided surface with *Merc. dulc.*, first trituration. If phymosis occurs, treat as advised under that affection. *Ac. Corall.*, *Merc.*, *Nit. ac.*, or *Pus.* may be required internally.

Lyc.—Quantity of yellowish humor behind the corona.
Staph.—Humid soft excrescenses behind the corona; itch on being rubbed.

Cystitis may arise spontaneously from neglected gonorrhœa, or from metastsais caused by violent abortive measures. The unskillful use of instruments, cold, hæmorrhoids and injuries.

Symptoms.—Pain in the supra pubic region, extending to the sacrum, the perineum and along the urethra. Tenderness on deep pressure over the pubes; frequent micturition with pain and difficulty; the symptoms being aggravated rather than relieved when the bladder is emptied; a tumor in the region of the bladder with pains of a burning, lancinating or throbbing kind; pulse frequent; skin hot and dry; tongue furred and whitish. If the neck of the bladder is affected, pain is mostly felt in perineum, and there is entire or partial retention of urine, with dysuria or strangury. The introduction of a bougie is exceedingly painful. If the posterior part of bladder is chiefly affected, violent tenesmus will be felt from its contiguity to the rectum. It sometimes terminates in abscess or complete suppression, which is a serious complication.

Treatment.—The principal remedies are *Ac.*, *Apis*, *Aloes*, *Bell.*, *Canth.*, *Chimaph.*, *Camph.*, *Dulc.*, *Dig.*, *Erig.*, *Chin.*, *Can. sat.*, *Eup. purp.*, *Sant.*, *Hydrast*, *Kali jod.*, *Puls.*, *Sulph.*, *Terebinth.*, *Uva. urs.*, *Squill.*, and *Sulph.* Injections of warm *Hydrast.* lotions thrown into the bladder. Hot fomentatious and sitz baths locally are very beneficial. A high degree of inflammation with suppression is very serious. It may terminate in resolution, suppuration, induration of its wall, or gangrene. In resolution there is gradual decline of symptoms. In suppuration chills or rigors occur with white matter in the urine. Induration is known by subsequent irritation, gangrene, coldness, prostration, weak pulse, hiccough and pallor.

Special Indications.—Acon.—Excessive and fruitless desire to urinate, with the emission of a few drops of red, deep-colored urine, violent fever and thirst; pains increased on making water; great tenderness in the supra-pubic region. In rheumatic cystitis it is invaluable.

Canth.—Shooting and burning pains in the vesica. region, both before and after emission, a few drops of bloody urine only passing at a time; cutting pains from the loins to the bladder; ardor urinæ, bloody urine with cutting, burning pains in perineum.

Coloc.—Tenesmus pains at urination felt over the whole abdomen; urine light-colored, depositing a tenacious sediment; after inflammatory symptoms have subsided, and mucus is discharging. In induration of the bladder walls after inflammation. See Merc. sol.

Cannab.—Complete retention; great desire to pass urine; a few drops of bloody urine is passed with burning pain.

Digital.—The neck of the bladder principally affected; constrictive pain in the bladder with retention; urine turbid or deep-colored and passed in drops.

Kali c.—Great desire to urinate, with scanty emission; great pressure before urinating; hot, scanty urine; frequent, painful emissions of small quantities, desire continuing after emission.

Phos.—Inability to retain urine long; constant desire for its evacuation and at the same time a movement of the bowels; profuse urination; dull pain in the hypogastrium prevents micturition; paralysis of the bladder—chronic cases.

Squilla.—Great desire to pass urine; emission scanty; urine hot and red with sticking pains in the fundus of the bladder, producing movements of the bowels—Phos.

Sulph.—Urine mixed with mucus or blood; burning during urination.

Nux vom.—When hæmorrhoids are present. In chronic catarrh of the bladder; *Acid phos.*, *Lyc.*, *Caust.*, *Copaiva*, *Carbo veg.* when paralysis sets in; *Ars.* and *Lach.* for gangrene. The diet should be regulated; avoid animal food, spices, wine. Carbonated water has a good effect.

Ischuria.—*Retention of urine* differs from suppression. In the latter the kidneys do not perform their accustomed functions. In ischuria more or less pain exists in the bladder, which is distended and can be felt in some cases above the pubes. There is urgent desire to urinate, with pain and sickness, and a very small quantity is emitted. The disease as a rule yields readily to remedies. If the bladder is over-distended, and a species of paralysis has set in, *Ac.*, *Hell.*, *Nux vom.* and *Dulc.* are important remedies. *Opium* if the difficulty is purely nervous. If there is stabbing pains in the urethra, with feeling of stiffness, worse at night, *Dig.*; *Apis* if complete suppression exists; *Buchu* relieves spasmodic retention. The following remedies may be consulted in particular cases : *Ac.*, *Cann.*, *Canth.*, *Puls.* and *Stram.*

If the symptoms are urgent and remedies have not had the desired effect, warm baths are beneficial; electro-galvanism and finally the catheter if the patient is suffering from over distension. In cases of stricture or paralysis if it is found impossible to relieve the bladder by these means; recourse must be had to puncture of the over distended viscus either by aspiration or puncture with a trocar. See retention following stricture.

Special Indications for Diseases of the Bladder and Urethra.—Aconite.—This great antiphlogistic is indicated when the skin is dry and hot; great thirst; unrest; nervous excitement; fear and anxiety; pain in the region of the bladder; retention of urine, with stitches in the kidneys; frequent and violent urging to urinate, with scanty emissions of red, turbid urine.

Angustura.—Tenesmus of the bladder, followed by profuse emission of white urine; tenesmus after micturition. One is obliged frequently to urinate, although but a few dark-yellow drops are emitted each time, causing a burning pain; orange-colored urine, soon becoming turbid.

Ananthemum.—Frequent emission of urine, which is turbid or soon becoming so: sensation of numbness and obstruction in the kidneys; sensation as if the kidneys and bladder were always full and swollen. Pressure and burning pains in the bladder, with urging to urinate every minute; the bladder cannot hold the smallest quantity of urine. Difficult, painful, intermittent urination; it stops and begins again the next moment. Fullness and distention of the bladder, with inability to urinate; urine turbid, thick, and full of mucus, as in catarrh of the bladder; retention of urine, with retraction of the urethral canal; urine brownish or yellowish, and bloody; very frequent urging to urinate, with burning urine, which is discharged in drops; urine with yellowish, grayish, or dark sediment; incontinence of urine, with involuntary urination when walking, and even at night in bed during sleep, as if caused by paralysis of the neck of the bladder; tenesmus vesicæ, with ischuria.

Apis.—Burning in the urethra before and after micturition; disagreeable sensation in the bladder, with a bearing down in the region of the sphincter and frequent desire to urinate; incontinence of urine, with great irritation of the parts, worse at night and when coughing; almost incessant desire to pass urine; urine high-colored; and more frequent emissions of small quantities; straw-colored urine, with brickdust sediment.

Asparagus.—Urging to urinate; burning in the urethra; frequent urinating, with fine stitches in the orifice of the urethra; urine scanty and cloudy; a little straw-colored urine is passed, which becomes turbid immediately after being passed, and is full of motes; after urinating, burning in the urethra, with sensation as if there was some urine yet to pass.

Arnica.—This remedy will often be indicated in affections of the bladder arising from mechanical injury, when retention of urine is present, with tenesmus of the neck of the bladder, with ineffectual efforts to urinate; urging, the urine dropping out involuntarily; brown urine with brick-red sediment; one has to stand a great while before the urine is emitted; urine strongly acid; specific gravity increased.

Arsenicum a.—Retention of urine, as if the bladder was paralyzed; scanty urine passing with difficulty; burning in the urethra during micturition, tenesmus and strangury; great desire to urinate, but does not pass any urine; urinates more frequently than usual. Involuntary emission of urine in the night when sleeping; ischuria; urine copious and burning hot. Greenish dark-brown urine, turbid when emitting it; urine profuse and dark-brown; hæmaturia; much sediment in the urine.

Belladonna.—Difficult micturition, the urine being passed guttatim, with frequent urging; the urine is yellow and turbid, sometimes depositing a reddish sediment; constant dribbling of urine; sharp stitches low down in the abdomen in the direction of the perineum; pains come on suddenly, and cease in the same way; feeling in the back as if it would break; enuresis, with profuse perspiration; paralysis of the sphincter vesicæ.

Berberis v.—Violent stitching pains in the bladder, extending from the kidneys into the urethra, with urging to urinate; frequently recurring crampy pain in the bladder; cutting constrictive pain in the bladder, when full or empty; burning in the urethra; burning pain in the female urethra during and after micturition; stitching pain in the female urethra, beginning in the bladder; violent stitches in the bladder, which compel one to urinate; burning pain in the bladder. Urine dark-yellow, red becoming turbid; copious mucous sediment, mixed with a whitish gray, and later a reddish mealy sediment. Greenish urine, depositing mucus. Blood-red urine, which soon becomes turbid, and deposits a thick mucus and bright red mealy sediment, slowly becoming clear but retaining its blood-red color; pains in the loins and kidneys frequently accompany the morbid urine, but not always; movement brings on or increases the urinary troubles.

Benzoic acid.—Vesical catarrh; irritability of the bladder; nocturnal enuresis in children; too frequent desire to evacuate the bladder; the urine normal in appearance; decrease of the quantity of urine; urine aromatic; urine of a very repulsive color, of a changeable color, brownish, cloudy, of an alkaline reaction; dark, reddish-brown urine, of greater specific gravity than normal urine, with an acid reaction. Indicated when the urine contains an excess of uric acid. The patient is pale, languid, with a feeling of weakness in the loins. Fleeting pains in the region of the bladder; a granular mucous, mixed whith phosphates, in the sediment of the urine.

Calcarea carb.—Pain in the bladder, and cutting on urinating; burning in the urethra before and after urinating; fine tickling stitches through the urethra; much sour-smelling urine passed at night; trickling of urine after micturition; involuntary passage of urine on every motion during menstruation; nocturnal enuresis; urine very dark-colored, without sediment; the urine has a pungent odor, is clear and pale; offensive dark-brown urine, with a whitish sediment; the urine soon becomes turbid, and deposits a whitish flaky sediment; a fatty pellicle forms on the surface.

Camphora.—Diminished power of the bladder. Retention of urine with urging to urinate; tenesmus of the neck of the bladder. Painful urination; burning urine; strangury; the urine passes in a thin stream, as if the urethra were contracted; yellowish green, turbid urine, of a musty odor; brown urine; red urine; the urine on standing becomes very turbid and thick, of a whitish green color, without deposit of sediment; urine contains mucus without sediment; urine with white or red sediment; urine increased, of a dark brown color; urine profuse, colorless, frequent; urine scanty.

Cannabis indica.—Inflammation of the bladder; burning, scalding, stinging pain before, during, and after urination; urging to urinate, with much straining; copious discharge of clear, bright-colored urine; the urine passes freely at times, then again in small quantities, with burning and biting; the urine dribbles out after the stream ceases; aching in the kidneys; thick, red urine.

Cannabis sativa.—Enuresis; paralysis of the bladder; drawing pain in the region of the kidneys, extending into the inguinal glands, with anxious nauseous sensation in the pit of the stomach; burning while urinating, but especially afterward; urging to urinate with pressive pain; stitches along the urethra when not urinating; white turbid urine; urine red and turbid; urine full of fibres, as of mucus, with pus

Cantharides.—Inflammation of uropoetic organs; pains in the region of the kidneys and urging to urinate; burning, tenesmus, and violent pains in the bladder; ardor urinæ; urine scalds, and is passed drop by drop, with extreme pain; hot, acrid and bloody urine: urine dark-colored, turbid, and scanty; urine loaded with mucous and sediment; cloudy urine, like mealy water, with white sediment.

Carbo veg.—Pressing pain in the bladder; contraction of the urethra every morning; frequent urging to urinate; copious emissions of light yellow urine; the urine has a strong odor; dark-colored urine; dark-red urine, as if it were mixed with blood; the urine deposits a red sediment.

Causticum.—Frequent, difficult, and painful micturition; involuntary emissions of urine when coughing; nocturnal enuresis; smarting pain in the urethra while urinating; light-colored urine, with flocculent sediment.

Chimaphila umbellata.—Chronic catarrh of the bladder; scanty urine, containing a large quantity of muco-purulent sediment; urine thick, ropy, of brick color, and copious bloody sediment; dysuria; inability to pass the urine without standing with the feet wide apart and the body inclined forward.

Colchicum.—Ischuria; frequent micturition, with diminished discharge of urine; constant burning in the urinary organs, with diminished secretion; brown, black urine; whitish deposit in the urine.

Colocynthis.—Alternate stitches in the bladder and rectum; itching at the orifice of the urethra, with desire to micturate; retention of urine, with a retraction of the testicles and priapism. Urine fetid; it soon thickens and becomes viscid. Urine becomes turbid, with copious deposit, often like gravel.

Conium m.—Pressure on the bladder; frequent micturition during the night, the urine cannot be retained; the flow of urine suddenly stops, and continues after a short interruption; the urine is thick, white, and turbid, or clear as water, with frequent calls to pass it; burning sensation when urinating; pressure in the neck of the bladder with stitches, worse when walking, better when sitting; burning in the urethra.

Copaiva bal.—Excessive irritation of the bladder. Inflammation of the urinary organs; swelling and dilatation of the orifice of the urethra, with pulsative pain throughout the penis. Constant, ineffectual desire to urinate; the urine is emitted in drops; foaming urine, greenish, turbid, with the odor of violets.

Digitalis p.—Inflammation of the neck of the bladder; pressure on the bladder, with the sensation as if it were too full, continuing after micturition. Continual desire to urinate, only a few drops being passed at each effort; the urine is dark-brown, hot, and burning when emitted. The urine is more easily retained in the recumbent posture; alternate emission of large and small quantities of colorless urine; contractive pain in the bladder during micturition.

Dulcamara.—Paralysis of the bladder, with involuntary discharge of urine; catarrh of the bladder; thickening of the coats of the bladder; retention of urine; strangury; painful micturition; urine turbid and white; reddish, burning urine; mucous sediment in the urine.

Erigeron.—Vesical catarrh, with pain and irritation; dysuria in children; they have frequent desire and cry when urinating; the urine is profuse, and of a very strong odor; the external parts are inflamed and swollen.

Gelsemium s.—Enuresis from paralysis of the sphincter, in children at night; profuse urination; urging with scanty emission, and tenesmus of the bladder; spasm of the bladder, with alternate dysuria and enuresis.

Graphites.—Micturition is preceded by a cutting pressing from the kidneys; anxious pressure in the bladder, with sudden desire to urinate, but scanty emission; nightly desire to urinate; nocturnal enuresis; frequent micturition; the urine has a sourish smell; the urine becomes very turbid, and deposits a reddish sediment.

Hepar sul. cal.—Nocturnal enuresis; weakness of the bladder: the urine is passed slowly, without force, dropping perpendicularly from the urethra; the urine is flocculent and turbid; dark-yellow urine, burning while passing; brown-red urine, the last drops are mixed with blood; sharp, burning urine, which corrodes the internal surface of the prepuce; the orifice of the urethra is red and inflamed, discharge of mucus from the urethra.

Hedeoma p.—Suppression of urine; tenesmus; painful urination; cutting, burning pains in urethra; scanty emission of urine, with frequent and urgent desire; urine very dark, like black tea.

Hyoscyamus n.—Enuresis; paralysis of the bladder; retention of urine, with pressure in the bladder, frequent micturition, with scanty discharges.

Ignatia a.—Irresistible desire to urinate; painful pressure, with a scraping sensation in the neck of the bladder, especially when walking; turbid urine; frequent emission of watery urine.

Jodium.—Nocturnal urination; retention of urine; increased secretion of thick urine, with dark sediment; urine dark; turbid; milky; with a variegated cuticle on its surface; ammoniacal smell of the urine.

Kali bich.—Frequent discharges of watery urine of strong odor; painful drawing from the perineum toward the urethra; urine with white film and deposit of mucous sediment.

Lachesis.—Copious emission of foaming urine; yellow-colored urine; copious brown-red urine; urine with red or brick-dust sediment turbid and dark urine, with a sediment of brown sand, and a severe cutting during micturition. Sensation as if a ball were rolling in the bladder.

Laurocerasus.—Retention of urine; pale-yellow urine, scanty, acrid, depositing a thick reddish sediment; burning in the urethra, and pressing after urinating.

Lycopodium c.—Involuntary micturition; stitches in the bladder; frequent emission of large quantities of pale urine; frequent micturition at night, with rare and scanty emissions of urine during the day; urine dark, with diminished discharge; red, sandy sediment in the urine; painless hemorrhage from the bladder; itching in the urethra during and after micturition; greasy pellicle floats on the urine.

Mercurius vivus.—The quantity of urine passed is larger than that of the fluid drank; burning in the urethra between the acts of micturition; inability to retain urine; frequent and violent desire to urinate, with scanty emission in a feeble stream; scanty red urine; urine turbid and fetid; dark-red urine, as if mixed with blood; the urine is very turbid, and deposits a sediment; pieces of white filaments are emitted after the urine; the urine looks as if it contained pus or mucus, and has a sour smell.

Natrum mur.—Involuntary micturition when walking, coughing, and laughing; desire to urinate day and night; stitches in the bladder during micturition, with a smarting, burning sensation in the urethra; pale urine, with brickdust sediment; discharge of mucus from the urethra; dark, coffee-colored urine.

Nitrate of Uranium.—Sore feeling in the pubic region; increased frequency of micturition; profuse nocturnal urination, straw-colored and fetid; burning in the urethra, with very acrid urine; desire to urinate immediately after voiding urine.

Nitric acid.—Enuresis; nightly desire to urinate, with cutting pain in the abdomen; scanty, turbid, bad-smelling urine; fetid urine; smarting, burning pain in the urethra while urinating; cramp-like, contractive pain from the kidneys toward the bladder; discharge of bloody mucus, or of pus from the urethra; the urine is cold when emitted.

Nux vomica.—Retention of urine; strangury; painful, ineffectual desire to urinate; painful emission of thick urine; discharge of pale urine, followed by passage of thick, viscid, whitish, purulent mucus from the bladder; reddish urine, with brickdust sediment; burning and lacerating pain in the neck of the bladder during micturition; hæmatorrhœa.

Opium.—Atony of the urinary bladder; retention of urine from a weakened condition of the contractile power of the bladder; dark-colored urine, which deposits a brickdust sediment; lemon-colored urine, depositing much sediment.

Pareira brava.—Violent pains in the bladder; pain in the thighs, extending down into the feet; strangury, with paroxysms of violent pain; the urine can only be voided while the patient is on the knees, with the head pressing against the floor; the paroxysms more usually occur in the morning from 3 to 6 o'clock; the urine has a strong ammoniacal smell, and contains a thick, viscid, white mucus.

Phosphorus.—Involuntary emission of urine; urine with a sediment of white flocculi; smarting and burning in the urethra, with frequent desire to urinate; tension over the region of the bladder; acrid, offensive-smelling urine; brown urine, with red, sandy sediment; hæmaturia.

Phosphoric acid.—Enuresis, with cutting, burning pain in the urethra, and cramp-pain in the region of the kidneys; spasmodic constriction of the bladder; profuse discharge of watery urine, in which immediately forms a white cloud; milky urine, with bloody, jelly-like lumps; burning in the urethra while urinating.

Phytolacca d.—Copious nocturnal micturition; violent urging to urinate; urine excessive in quantity, or scanty; dark-red urine, which leaves a stain on the urinal of a mahogany color, which adheres very closely; the urine deposits a chalk-like sediment; pain in the bladder before and during micturition; albuminous urine, with increased specific gravity; frequent and painful inclination to urinate.

Plumbum.—Paralysis of the bladder; tenesmus of the neck of the bladder; ischuria; difficult emission of urine; the urine is mixed with blood; copious red or yellow urine.

Pulsatilla.—Vesical catarrh; incontinence of urine; enuresis nocturna; frequent desire to urinate, with a drawing sensation in the abdomen; spasmodic pain in the neck of the bladder after micturition, extending to the pelvis and thighs; involuntary discharge of urine when coughing; the urine is discharged in drops when sitting or walking; burning in the urethra while urinating; hæmaturia; scanty red-brown urine, with brick-colored sediment; bloody or mucus deposit.

Rhus tox.—Tenesmus vesicæ, with emissions of only a few drops of blood-red urine; diminished secretion of urine; incontinence of urine; urine hot, white, and muddy, or pale, with white sediment; dark urine, soon becoming turbid.

Ruta g.—Nocturnal enuresis; continual pressure on the bladder, as if always full; the desire to urinate continues after micturition; involuntary discharge of urine at night in bed, and while walking during the day; frequent urging, with emission of green urine.

Sarsaparilla.—Pain and cramps in the bladder, with urging and burning; urine pale and copious; frequent urging to urinate, with scanty but painless discharge; urine clear and red. Severe strangury, with discharge of white, acrid, turbid matter, with mucus; painful retention of urine; urine frequently voided; does not become turbid, but deposits a cloud; frequent and copious discharge of pale urine, which become turbid on standing, like clay-water; urine either too frequent, copious, and pale, or scanty, slimy, flaky, clayey, or sandy; irridescent pellicle on the urine.

Sepia.—Nocturnal enuresis, especially during the first sleep; constant desire to urinate, with painful bearing down in the pelvis in the morning; burning in the bladder and urethra; pressure on the bladder in the evening, with burning after urinating; urine turbid, with red sandy sediment and a cuticle on the surface; urine has an offensive smell and deposits a white sediment.

Squilla m.—Tenesmus of the bladder after micturition; frequent calls to urinate, especially at night, with scanty emission, or profuse discharge of pale urine; sanguinolent urine, with a deposit of red sediment.

Stannum.—Painless retention of urine; the urging to urinate is absent, as in atony of the bladder.

Staphisagria.—Profuse discharge of pale urine, with urging; frequent desire to urinate, with emission of a small quantity of dark-colored urine; burning in the urethra during and after urinating; urging after micturition, as if the bladder had not been emptied.

Strychnia.—Atony of the bladder; retention of urine or incontinence, when these conditions depend on impaired power of the detrusor muscle of the bladder, from over distension.

Sulphur.—Nocturnal enuresis; violent desire to urinate at night; copious micturition after midnight; stitches in the bladder; cutting pain in the urethra while passing urine;

the urine is sometimes clear, and sometimes contains a thick sediment; rose-colored urine; fetid urine, a greasy film forming on the surface.

Terebinthina.—Strangury; dysuria; violent dragging and cutting pain in the bladder; burning in the bladder; urine scanty and red, or bloody urine; difficult micturition; the urine has the odor of violets, with deposit of mucus, or a thick muddy sediment.

Thuja o.—Frequent urging to urinate, with profuse emission; the urine looks like water when passing, but becomes cloudy on standing; red urine, depositing a brickdust sediment; burning in the urethra during and for some time after micturition.

Uva ursi.—Hæmaturia; painful micturition, with burning; urine slimy and purulent.

Veratrum a.—Diuresis; involuntary emission of urine; painful pressure on the bladder and burning during micturition; frequent but scanty emissions of dark-red urine: green urine.

Phimosis is an abnormal contraction of the terminal border of the prepuce, in front of the glans. It may be *congenital* or *acquired*, *acute* or *chronic*. Congenital, though rare, is when the prepuce is imperforate or nearly so, and the urine not being emitted, collects between the prepuce and glans, forming a sac or tumor. The acquired, is the result of cicatrization of ulcers or chancres, or is sympathetic with gonorrhœa, balanitis, etc. Frequently constitutional symptoms are developed in the chronic variety, varying from nervous derangements, to complete incoordination of motion and loss of equilibriating power. In the acquired variety the preputial secretion is retained producing much irritation and occasional attacks of inflammation with discharge (balanitis).

Treatment.—The remedies curative of this affection, if surgical action is not demanded, are: *Ac.*, *Arn.*, *Ars.*, *Caps.*, *Cannab.*, *Calc.*, *Hepar*, *Euphras.*, *Hyperic.*, *Merc.*, *Rhus*, *Sepia*, *Thuya*, *Sulph.*, *Viola tri.* The remedy to be selected in accordance with the constitutional and local manifestations.

The *local treatment* consists of warm medicated lotions of *Calend.*, *Hyperic.*, or *Thuya*, frequently employed. When all medical agents fail, recourse may be had to an operation, viz: If the foreskin is long and tight, or thickened by cicatricial surfaces, draw it well forward, hold between the blades of a forceps and cut off by one sweep of the bistoury.* In cases of less severity, the prepuce may be slit up on the dorsum as far as the base of the glans, by means of an oiled director passed under-

* Dr. E. P. Hurd reports a case where loco-motor ataxia was developed in a lad 7 years of age. Various methods of treatment were employed, unsuccessfully. The true cause of the disorder proved to be phimosis;—circumcision was performed with gradual improvement and final recovery. Dr. Thompson, of Albany, N. Y.: Where epileptiform convulsions followed by phimosis, which also recovered by circumcision.

neath the foreskin. The chief seat of constriction being in the mucous membrane, care should be taken that it is well opened, and a second piece snipped out if necessary, and stitched to the skin. Apply cooling lotions of *Hyperic.* to the parts after operation, to prevent inflammation. *Rupturing* the mucous membrane by Hutchinson's forceps has proved successful.

Paraphimosis is the reverse of the former; when the prepuce is drawn over the glans and allowed to remain there, producing contraction and stricture of the foreskin; serious results may follow. The penis is constricted; the skin becomes œdematous, and the mucous lining of the prepuce, and the glans become congested, followed by ulceration or sloughing; the strangulated glans being ill provided with resistant power or control, may become gangrenous and ultimately die.

Treatment.—In recent cases efforts should be made to reduce the stricture and restore the glans from its incarceration. The parts having been well oiled, the surgeon takes the penis between the fingers of both hands, and draws the constricted portion slowly but steadily forwards; with the thumbs at the same time, he compresses the glans, and pushes carefully backwards. If this fails, the constriction may require division by raising a fold of the skin by introducing a sharp pointed bistoury beneath the tightened band, and cutting outwards, when reduction can be effected. Local applications of *Hyperic.* or *Staph.* should be employed and the patient placed in a recumbent position, with the penis elevated, so as to favor the circulation of blood through the weakened parts.

The following remedies may be beneficial in overcoming the inflammation in the external structures, viz: *Arn.*, *Apis.*, *Ars.*, *Merc.*, *Calend.*

Herpes of the Glans and Prepuce is characterized by the formation of small vesicles or excoriated points upon the mucous membrane of the glans, attended by smarting, itching, and chiefly occurring in persons of a gouty dyscrasia, with an irritable mucous membrane. Treatment will be required to overcome the constitutional irritation. Local lotions of *Rhus. rad.* or *Ranunc.*

are very beneficial. Internal remedies are *Dulc.*, *Hepar.*, *Graph.*, *Merc.*, *Phos.*, *Rhus tox.*, *Ranunc.*, *Sarsap.*, *Sepia.*, *Tellur.*, *Tiglium*, cleanliness, etc.

Hypertrophy of Prepuce is the result of chronic irritation or disease; is usually limited but may become so extensive as to call for surgical interference. It consists of solid œdema of the areolar tissue of the prepuce, and of the sub-integumental structures of the body of the penis, which becomes enlarged and club shaped. For remedies consult *Nat. carb.*, *Graph.*, *Elaps cor.*, *Cal. seg.*, and *Puls.* Surgical relief consists in the excision of a v-shaped piece from the dorsum of the penis, or circumcision.

Condylomata, Warts or Sycosis often follow gonorrhœa, particularly if the patient has not observed due cleanliness, the discharge being permitted to lodge beneath the prepuce. They are generally situated along the corona or on the frenum; in females they occur about and in the pudenda. They present different appearances; are fig-shaped, cauliflower like, or like a cock's comb, pear or raspberry.

Pathology.—The pathological condition is a morbid thickening of the chorion, rete mucose and epidermis, with hypertrophy of the papillary body. They sometimes appear at the verge of the anus, the angles of the mouth, and perineum; are soft, spongy, bleed easily and are liable to return after cauterization, excision or ligature. They secrete a peculiar gleety and fetid fluid, and are dependent upon veneral infection.

Treatment.—The remedies are: *Acid. nit.*, *Cannabis*, *Lyc.*, *Phos. ac.*, *Calc. c.*, *Merc. cor.*, *Magn.*, *Staph.*, *Sabin*, and *Thuja.* I have never failed in the cure of these little pests by excision and *Nitric ac.*, or *Thuja* applied to the base and at the same time given internally.

Horny Excrescences sometimes spring from the glans penis and appear first as soft, semi-transparent masses enclosed in complete cysts. As they increase in size they become dense and hard and assume all the characteristics of horny structure. They grow slowly and sometimes attain considerable size. An instance of this growth is reported by Dr. Jewett, of Connecticut, who describes it as 3½ inches long, and ¾ of an inch in diameter at the base. Treatment, see horny tumors page 134.

Persistent Priapism is the result of excessive venery. The erection of the penis is not accompanied with any sexual desire, but is attended with great pain; a feeling of weight about the perineum; much anxiety and constitutional disturbance; the organ is singularly hard and unyielding, and may remain in this position for hours and even days.

The *pathology* of this disease is supposed by some to be the result of extravasation of blood into the corpora cavernosa; by others it is referred to sympathetic or reflex nervous irritation. A case of this kind I saw many years ago at St. Louis, in a newly married couple, where the organ became so hard and unyielding that I was compelled to incise the corpora cavernosa and let out a quantity of blood. After a few hours, with three or four doses of *Ac.*, given internally, and followed by *Caust*, I succeeded very soon in overcoming the trouble.

Gangrene of Penis occurs in broken constitutions from syphilitic phagedæna, or as the result of gonorrhœal phimosis. This is an exceedingly rare disease at the present time, owing either to non-mercurial complication, or to the gradual decrease of the more virulent forms of syphilis. Treatment, like gangrene in other parts, which see.

Fibroid Tumor of the Penis.—The penis may become the seat of this affection in common with other structures of the body, and the tumor maintains the same peculiarities that occur in the ordinary fibroid growth, and is treated the same as in other parts. See fibroid tumors.

Chronic Orchitis, or *sarcocele* of some authors, may be the result of an imperfectly cured acute orchitis, or it may be chronic from the commencement of the disease, resulting from gonorrhœa, or occurring as an independent affection. The epididymis is often the primary seat of the disease, which gradually involves the whole gland and presents the appearance of an inelastic, uniform, oval tumor, exceeding two or three time the size of the normal testicle. The disease progresses insidiously, the sensitiveness of the gland is largely lost; is more severe at night than in the day time, and when it is accompanied with effusion within the tunica vaginalis, it is termed *hydro sarcocele*. Its *pathology* consists of a yellow solid lymph, effused in-

to the substance of the gland, extending into the vas deferens and deposited in the tubuli seminiferi. Its smoothness, uniformity, gradual progress, and absence of glandular enlargement distinguishes it from malignant disease of the testicle.

Treatment.—Rest in a recumbent position, with applications of *Ham.*, *Bell.*, or *Hyp.* lotions, the scrotum being supported by a hair pillow, as in all cases of inflammation of its external structures. Give one of the following remedies: *Aur.*, *Clem.*, *Agnus. c.*, *Graph.*, *Argent. nit.*, *Bell.*, *Kali c.*, *Kali jod.*, *Lyc.*, *Rhodod.*, *Merc.* and *Rhus.* Strapping the testicle and use of a suspensory bandage (see orchitis).

Fungoid Growths of Testicle following orchitis are of two varieties, *benign* and *malignant.* In the benign, the mass is granular, hard, very sensitive and not disposed to heal; bleeds easily. The growth is paler and more consistent than the former, with tumefaction of the cord. Pressure upon the testicle produces that peculiar sickening sensation resembling a healthy condition; while the malignant is soft and spongy, color darker, with frequent attacks of hemorrhage, and pressure upon the testicle gives no sickening sensation.

Treatment.—The remedies are: *Merc. viv.*, *Phos.*, *Clem.*, *Calc. c.*, *Ars.*, *Con.*, *Baryt.*, *Carbo. veg.*, *Mez.*, *Kali. c.*, *Nit. ac.*, *Spong.*, *Oleand.*, *Thuja*, When remedial agents fail, castration is the only means of relief. See remedies for orchitis.

Cystic Sarcocele is an enlarged, somewhat elastic, indurated, lobulated and globular tumor occupying the testis, attended with weight, heaviness, aching and numbness, with an enlarged and varicose state of the veins of the cord. It is a rare disease, grows insidiously, with cystic fluctuation at its upper portion, resembling somewhat hydrocele of the cord. The enlarged testicle may become of very great size.

Pathology.—A stroma of various modifications of connective tissue in all stages of growth, in the midst of which are irregular epithelial spaces, which dilate and form cysts lined by epithelium. It may become malignant by degeneration, the stroma assuming the form of cancer, and the epithelium taking on the true carcinoma cells. It is said by Curling to be the result of morbid changes in the ducts of the rete testis. It may be confounded

with the hydrocele, but the absence of translucency, its globular shape, weight and varicose state of the veins of the cord will determine its nature. An exploratory incision will solve all doubt, or the use of the aspirator will determine diagnosis.

Treatment in dubious cases: *Apis.*, *Col.*, *Calc.*, *Dig.*, *Ars.*, *Con.*, *Graph.*, *Lyc.*, *Plat.*, *Sepia.*, *Sil.*, and *Sulph.* I cured two cases of well marked cystic disease of the testicle with *Apis*, and *Conium* Removal of the diseased gland is the last resort of the surgeon.

Enchondroma of the Testicle is a frequent accompaniment of cystic sarcoma, and may appear alone, deposited in larger or smaller nodules, or infiltrating the gland. Its usual seat is the body, but it may invade the epididymis. When it attains a large size it loses its purely cartilaginous character, and is found mixed with sarcoma-tissue and complicated with cysts, and merges into the disease just considered. For treatment consult enchondroma under the head of tumors.

Cancer of the Testicle, or Malignant Sarcocele invariably assumes the encephaloid character, and is the only form of cancer ever occurring in that gland. *Symptoms:* dragging pain and weight, with induration and enlargment; tense and elastic, but smooth and heavy; as it increases it becomes rounded, doughy or pulpy, sometimes hard and knobby; the cord becomes enlarged, hard and knotty, and the scrotum becomes adherent to the growth; ulceration, and finally a fungus projects, when all doubt will be removed as to the nature of the malady.

Treatment.—Refer to carcinoma. Removal of the organ is advised; to be of permanent service, it should be done early.

Hypospadias is an arrest of development in the medial line of the penis, leaving a slit or a fissure connecting with the urethra; occurring on the under surface of the organ and is confined to the glans and upper part of the penis, though it occasionally extends backward to the root of the organ, cleaving the scrotum in twain, and is erroneously considered as examples of hermaphroditism. See part xviii, operative surgery, page 657: malformation of the urethra. Treatment, is plastic operations, though they are mostly incurable.

Epispadias.—This is the reverse of the former, where the deformity occupies the upper surface of the penis; it is a rare deformity and is referred to the condition termed extroversion of the bladder. See part xviii, operative surgery, page 657.

CHAPTER VI.

Stricture of the Urethra may be either *spasmodic* or temporary, *inflammatory* or pathologic, *organic* or permanent, involving three distinct conditions. In the first, there is a spasmodic action of the muscular tissues surrounding the urethra, and is the result of high living, stimulation, exposure, free sexual indulgence in persons of excessive nervous irritability; irritation in the rectum, dependent upon ascarides, hæmorrhoids, fecal accumulations, etc. The second proceeds from congestion or inflammation in the structures of the urethra, wherein an inflammatory stricture exists. It occurs in gouty and rheumatic subjects, suffering from irritability of the skin and mucous membrane.

Treatment.—The two former conditions yield readily to appropriate medication. In the early stages prompt relief will be afforded by the sitz bath, hot sponge, or hot fomentations to the perineum. Richardson's nebulizer, chloroform, or either of the following remedies, in accordance with their pathogenesis, may be given: *Ac.*, *Bell.*, *Canth.*, *Con.*, *Lach.*, *Graph.*, *Gels. Camph.*, *Clem.*, *Dig.*, *Merc.*, *Eupat. p.*, *Cann.*, *Nux v.*, *Thuja.*, *Petros.*, *Prunus. s.*, *Sandalum.*, etc., etc. A soft flexible catheter or bougie may be used after the inflammatory contraction has in part yielded, which may be employed from time to time, till all pathological conditions have yielded to treatment. Consult special indications at the end of this chapter.

The size of the male urethra as influenced by the size of the penis has been made the subject of much controversy. Dr. Otis contends that there always exists a constant relation between the size of the flaccid penis and the capacity of the urethra. Helmuth and others on the contrary maintain an opposite opinion and my experience corroborates that of Prof. Helmuth, "that a small penis may have a large urethra, and the tube may be of small calibre in an organ of good size." The urethra is subject to abnormal contractions during its whole extent. The portions of the urethra most liable to stricture is also a matter of dispute. I

am inclined to accept the views of Dr. Otis, that a large proportion of strictures are found within the first *four inches* from the meatus and they decrease in frequency as you measure toward the vesical opening. In one respect however all authors agree in assigning the most frequent position to be at the sub-pubic curvature. Small urethras are more predisposed to stricture than large ones: in all cases the danger of permitting gleet to run on indefinitely is very great, as it will almost invariably eventuate in stricture, which of itself should arouse the apprehensions of the surgeon as to the existence of stricture.

Permanent or Organic is the result of inflammation in or near the urethra; is due to the organization of plastic lymph during the inflammatory stage either upon the surface or into the sub-mucous areolar tissue. Causes, ill-treated gonorrhœa, ulceration, intemperance; morbid urine, or traumatism; its character varies, sometimes annular, long or one sided, and partakes of a gristly cartilaginous material, blocking up and contracting the urethra. Its most frequent seat is in front of the pubic arch; once formed it tends to become worse.

Pathology.—Contraction gradually increases the size of the urethra behind the structure which dilates and becomes sacculated. The muscular coat of bladder thickens and hypertrophies, sacculi are formed; the mucous membrane is disordered; its evil influences gradually extend backwards; ureters become distended and tortuous; kidneys congested and prone to inflammation. Calculi may be formed and a general nervous depression is produced. It is not a disease of advanced life except when it proceeds from venereal disease.

Symptoms.—Frequent desire to void urine, with pain and difficulty; stream diminished, twisted, forked or scattered; urine dribbles away after evacuation; uneasy sensation in perineum; itching at the glans, with gleety discharge. As the affection progresses all symptoms increase; irritation extends to the testicles, prostate and thighs. In bad cases the urine passes drop by drop with much straining; rigors or prostration, fits of retention take place, through congestion and spasm; pain during coitus, with a sense of heat and soreness in perineum. The first thing to be done in the treatment of stricture is to ascertain its locality

and extent. To accomplish this the urethra-meter of Otis is most reliable. It is introduced into the urethra closed, and having passed it onwards as far as the membraneous portion, the surgeon turns the screw in the handle until a sensation of fulness is felt by the patient, when it is gradually withdrawn till it engages the stricture. At this point the screw must be turned in the opposite direction until it is reduced to such a size that it will pass the obstruction. The hand on the dial will mark the size of the stricture. The bougie a boule, or the metallic bulbous sound is also used to define the locality and extent of the stricture. Dr. Otis has invented an urethral endoscopic tube for viewing the interior of that canal. It is six inches in length, and from 17 to 19 of the English scale. Having ascertained the location and extent of the stricture, the next process is its cure, or rather to restore the canal to its normal calibre, and maintain it in that state. To the accomplishment of this object the profession is greatly indebted to Dr. Otis, of New York, for his valuable suggestions and practical experience in the treatment of this disease: The question then presents itself is whether we shall follow the treatment of Dr. Otis of slitting open the stricture, divulsing it, or overcoming it by dilatation The last of these processes is, I think, the best adapted for the cure of stricture. These mechanical measures are: 1st. Dilatation by a bougie or sound. 2d. Dilatation by means of expanding instruments. 3d. By a catheter retained. 4th. By the caustic bougie. 5th. By incision from within. 6th. By external incision or dividing it from the perineum. Compensating strictures occur in front of the main one, and the anterior portion of the canal becomes alternately dilated and contracted by the stream of urine being deflected in an oblique direction after it passes the first obstacle. The point of impingement against the urethral wall takes on inflammatory action, and the result is a compensating stricture. Like all derangements of compensation, the secondary stricture relieves the morbid status of the primary one.

Treatment is to give early attention to all disorders of the system, mental disquietudes, and especially those involving the pelvic organs, chastity, temperance, rest, early hours, warm baths and remedies given to meet the various subjective symp-

toms that may arise. In this way very much relief may be obtained, and in some cases cures have been effected. The chief remedies are: *Dig.*, *Clem.*, *Eupat. purp.*, *Prunus.*, *Sepia*, *Gels.*, *Bell.*, *Thuja*, *Acid nit.*, *Kali jod.*, and medicated plasters to the perineum. When medication fails then use the second class of remedies, which is to restore the urethra to its normal caliber, and to maintain it so. This is done by gradual or forcible dilatation, incisions, or electrolysis. Gradual dilatation consists in passing a graduated bougie from time to time until the urethra is restored. In very bad cases use a horse hair, a filiform bougie, a whalebone guide, or a metallic sound. Be careful of the entanglement of the instrument in one of the lacunæ, and beware of *false* passages. A skillful hand will detect the slightest irregularity or accident. Remember every stricture can be cured that permits the slightest flow of urine. Dilate *gradually* if possible and begin with the smallest filiform bougie, increasing the size from time to time till restoration of the canal. *Rapid and forcible* dilatation may be made when the stricture yields readily and time is of the greatest moment to the patient. This is effected by divulsion (Otis' or Holt's dilators), or internal division by the urethrotome. In the latter case care must be exercised to divide the stricture *entirely*, which can be ascertained by passing one of Otis' bulbous sounds. In very resilient strictures, two or more attempts may be required to completely cut through the stricture; if success is desired the division must be *thorough*. The operation requires great care and an intimate knowledge of the structures, as well as considerable experience in manipulation. All internal operations are referred to two important principles: division of the structure *from* or *towards* the badder, each process having its own advocates. I prefer dividing it from the vesical side to the meatus.

Dr. Otis an ardent advocate of internal incision, thus writes: "I am a believer in the *true curability* of urethral stricture, notwithstanding that authorities are a unit to the contrary. I think I can bring evidence that will be convincing, that in the great majority of cases of urethral stricture, a complete eradication of the trouble is within the reach of every competent surgeon. To warrant the reasonable expectation of cure, the stricture must be

completely divided at some one point, and this cannot be with certainty accomplished without a knowledge of the *normal* urethral calibre. The normal calibre once ascertained by means of the urethra-meter, or by measurement of the flaccid penis, the method by which the sundering of the stricture at some one point is accomplished may vary, and rest with the judgement of the operator. If dilatation or divulsion be selected as the medium through which to effect this result, the procedure must be carried far enough to *completely* rupture every fibre of the contraction; if division, *every fibre* must be completely severed, or subsequent re-contraction is certain. Neither divulsion alone, or simple urethrotomy, is capable of effecting this with any certainty. It requires a combination of those two methods to accomplish the desired result; my first dilating urethrotome was constructed for the purpose of meeting these necessary requirements which has proved permanent so far as the principles of operation is concerned." He further adds: "In all cases of stretching *at or near the meatus*, I am accustomed to make the divulsion on the *inferior* wall of the canal, and very thoroughly, with a straight bulb-pointed bistoury. The utmost freedom to the passage of the bulbous sound must here be insisted on and not a single trace of contraction left uncut." As a means of preventing inflammatory action after operation upon the penis, Dr. Otis uses cold water, "by means of a small india rubber tube arranged so as to encircle the penis and through which water of any desired temperature is carried by syphonic action." In none of the 100 cases reported by him, has subsequent dilatation been attempted or required to effect a cure after the healing of the wound made during the operation. The use of sounds subsequent to the operations, is simply to separate the cut surfaces, and not for the purposes of dilatation and their use is discontinued so soon as a full-sized bulb can be passed through and beyond the previous site of stricture and withdrawn without a trace of blood accompanying or following the use of the instrument. Recontraction of stricture, after operation is simply due to the incomplete division, and this will as a rule, be detected within one week, or at most two weeks, by which time stricture tissue *distended* not *divided*, will sufficiently recontract to become readily

recognized by the full-sized bulb. If, then, no stricture can be recognized, the cure of the difficulty may be considered *complete* and no further treatment will be required." The urethrotome of Dr. Otis is one of the latest and very best instruments devised for that purpose. It is made to cut from before backward and in my hands has equalled its fullest commendation. Nevertheless I hold it as a rule that every stricture can be cured by dilatation that permits the passage of the smallest filiform bougie through it.

External Urethrotomy may be justified only in exceedingly obstinate cases, in traumatism, or in impassible strictures. Syme's method, or rather modification of external incision, is the only safe and sure means of performing this operation from without. The patient is placed in the lithotomy position, a grooved director (after dilatation of the stricture) is passed through the stricture, the left forefinger as a guide introduced into the rectum, and a straight bistoury, its back to the rectum, is plunged into the median line of the perineum behind the stricture, and *into the groove of the director*, when the bistoury is made to divide the stricture from behind forwards. Another method which I hold to be preferable to this, is to shave the perineum, introduce a capillary whale bone bougie (probe pointed) carefully into the bladder, pass along this a grooved metallic staff, engaging the free end of the guide, an assistant holds the staff and guide. The surgeon, after an examination per rectum, incises freely the skin and superficial fascia of the perineum along the median line from the base of the scrotum to within half an inch of the anus. Dissect inwards till the urethra is seen, and divide it, the knife falling into the groove of the catheter. The edges of the urethral incision are kept open by loops of silk. After withdrawing the guide the stricture and a corresponding portion of the urethra are divided by a modified canalicular knife. The catheter is now introduced into the bladder. I have performed this latter operation three times successfully, yet I regard it as a principle which should guide every surgeon, that while a director or curved grooved staff can be made to pass the stricture, external urethrotomy is never justifiable; internal urethrotomy produces the best results. A catheter may be retained in

the bladder by a ring placed around the penis, which is secured to the body, and attaching two pieces of narrow tape from the rings of the catheter to the ring around the penis. Another simple contrivance is to pass around the catheter a piece of thin gauze or linen, and make it encircle the penis, then put around all an india rubber ring. A catheter may be retained in the female bladder by a T bandage, and two narrow pieces of tape attached to the two tails of the vertical portion of the roller.*

Electrolysis is the best, most satisfactory, and most rational means of treating stricture under any form or method. The modus operandi is as follows: "Introduce into the urethra an electrode *soaped*, not oiled, one size larger than the stricture will admit (insulated to the tip) down to the stricture; attach to the *negative* pole of the battery; complete circuit by the broad sponge reophore, moistened with salt and water, placed in the hand of the patient or upon some part of his body. As soon as the patient *feels* the current, the intensity is sufficient, and should not be increased beyond this point. Be careful to avoid all production of pain, keeping the electrode pressed in contact with the stricture, but not forced, in a few minutes we find the electrode slipping through the stricture easily. If a second stricture is found treat it in the same way. Repeat this operation every few days till the stricture is cured. A current from 6 to 12 cells of † McIntosh's elements is all that is needed. Great stress is laid upon the introduction of the *negative* electrode, as the positive produces an eschar which heals by cicatrization, and instead of curing a stricture, will increase it. I have seen this method tried with most brilliant results in several cases. For subsequent internal treatment of the urinary and other troubles that arise during the local treatment recommended in this disease, see remedies presented under special indications at the end of this chapter.

Retention of Urine must not be confounded with suppression, wherein no urine is secreted, but is an inability to void the con-

* See Franklin's Minor Surgery; bandaging, etc.

† McIntosh Galvano Faradic batteries are by far the best instruments for performing electrolysis that I have ever used. I have been so many times disappointed in the use of other instruments that I have at times abandoned the idea of this brilliant and successful method of cure. Since my attention has been called to the McIntosh instrument I have made two remarkable cures of this terrible disease, and I cannot too highly recommend its use.

tents of the bladder. There are two varieties, first, a want of power in the bladder to perform the act, and second, an obstruction to the passage of urine. The first is due to some lesion of the spinal cord, followed by paralysis. The urine collects in the bladder, is forced out and dribbles away by the urethra. For treatment see cystitis, page 61.

Symptoms.—Retention from obstruction has an urgent desire to pass water with inability; straining; pain, with great anxiety and distress; the bladder rises above the pubes, forming an elastic, fluctuating tumor, dull on purcussion; if retention is not removed, the ureters become involved, the kidneys are affected with pyelitis, suppression, followed by coma and death. It frequently happens that the urethra yields behind the point of obstruction and extravasation of urine results.

Treatment.—When retention results from stricture, or enlargment of prostate, the cause must be removed if possible, by catheterization; if this cannot be effected, try warm baths, belladonna, enemas, chloroform, anæsthesia, electro-magnetism; conjoined with one of the remedies recommended under the head of special indications at the end of this chapter. If all means fail, recourse must be had to puncture by trocar and canula through the rectum behind the prostate, above the pubes, or by aspiration; the latter is by far the safest and freest from danger. After relief, attention must be given to removal of cause.

Extravasation of Urine may proceed from the bladder or urethra, by ulceration, from surgical operation, by direct violence, stricture or traumatism. Symptoms.—Patient is conscious that something has given away, perhaps while straining; the rupture is in front of the triangular ligament; relief is afforded; soon the scrotum and lower abdomen become infiltrated with urine; the skin is stretched, crepitates, feels doughy, and if not met with free incisions, sloughs and becomes gangrenous; inflammatory symptoms of an asthenic type follow; the tongue is brown; great prostration ensues, with a tendency to delirium. If extravasation is from injury, the rupture occurs in the urethra, perhaps in the bladder, the latter being most certainly fatal. Treatment:—Free incisions, to give vent to the imprisoned urine and the case treated as in gangrene.

Urinary Abscess is a frequent result of stricture and follows ulceration of the urethra, terminating in abscess in the perineum, taking its origin from the bulb or membranous portion of the urethra.

Symptoms.—It begins as a small, hard, circumscribed and painful tumor in the perineum and increases steadily; produces some constitutional trouble with weight and throbbing in the perineum, heaviness in the loins, uneasy sensation at neck of the bladder, with shivering, nausea and febrile manifestations; suppuration results, the pus is discharged naturally or artificially, and there remains a fistula through which urine continually escapes.

Urinary Fistula forms most frequently in the perineum as a consequence of stricture or urinary abscess as above stated. They are sometimes met with in the groin, inside of the thigh, and in the scrotum; they are usually single in the scrotum and penile portions of the urethra, but are numerous in the perineum; they differ in size and tortuosity; the scrotum and penis become enlarged, indurated, and almost cartilaginous in structure; the urine oftentimes is entirely voided through these openings. Fistulæ may likewise arise from injuries or falls, by which the urethra is ruptured; the urine is then extravasated into the loose cellular tissues of the perineum and scrotum, where it occasions much inflammation and distention of the textures, merging perhaps, into gangrene and sphacelus, and becoming a disease of the most serious import. It sometimes lays bare the urethra and testicles, at others, it dissects its way in different directions, producing one or more fistulas, and endangering the patient's life. A very interesting case of this kind was presented at my clinic last year, U. of M., where there were *two* fistulas, the one terminating in the rectum, the other above the pubes, and about midway between the symphysis and the anterior superior spinous process of the ilium. I operated upon this case after the rectal opening was occluded, by making Syme's external urethrotomy, opening into the urethra at the point of rupture, and introducing a seton into the pubic fistula, downwards to the urethra, and emerging it at the perineal opening. Within three days I had the satisfaction of seeing all the urine pass through the new orifice along side of the seton. I gave directions to have a strand or two of the seton

removed every day or two after the stream was well established through the perineal opening, with the intention of closing and healing up the pubic fistula, and transferring it to the perineum, and the boy returned home under the care of his physician, with the intention of returning to have the case completed. By some inadvertence the seton came out, and as a consequence the perineal opening closed, and the urine again escaped through the pubic aperture. The case fell into the hands of another surgeon ; several unsuccessful operations were made; the patient grew rapidly worse and was sent home in a more serious condition than when he left me. Since then, I have no knowledge of the case.

Treatment.—The first thing is to dilate the urethra and establish the natural channel for the urine. The next to cure the fistulæ; this may be done by free incisions to the bottom of the fistulæ, and dressings applied so as to heal them from the bottom to the surface; it is often effected by constitutional and local remedies. The remedies of most service are: *Ars.*, *Berb.*, *Calc.*, *Carb. an.*, *Phos.*, *Puls.*, *Sil.*, and *Sulph.*; in small fistulæ, cantharides in tincture, injected into the sinus; incisions and galvanism, and an urethro-plastic operation may be required.

Prostatitis.—The acute form is produced by gonorrhœa, injuries, irritation of the genitals or rectum, and exposure to cold or wet.

Acute Symptoms are pain, heat in perineum, tenderness on deep pressure; frequent micturition, and with difficulty; painful evacuation of the bowels; rectal exploration denotes enlargment of the gland and tenderness to touch; fever and thirst accompany; terminates in resolution, suppuration or abscess.

Chronic Prostatitas, common to mature age, comes on insidiously. There is weight and fullness in the perineum extending to the anus; pain with diminished power in voiding urine; urine cloudy; gleety discharge; pain in coitus and defecation, and sometimes spermatorrhœa, and cystic irritation; muscular fibre hypertrophied; sometimes the whole gland is enlarged. At others one lateral lobe; occasionally the middle lobe between the "ejaculatory ducts" is involved. This alters the course and dimensions of the urethra. It will be *twisted* when one lateral lobe is enlarged. *flattened* and *compressed* when the posterior middle lobe is hyper-

trophied; as a consequence the urine is passed slowly and with great pressure; incontinence, discomfort, and urinary tenesmus follow.

Treatment.—*Ac.*, *Bell.*, *Hepar*, *Puls.*, *Merc.*, *Thuja*, for the acute, and *Agnus*, *Alum*, *Bar. iod.*, *Calc. jod.*, *Con.*, *Dig.*, *Caust.*, *Lyc.*, *Kali h.*, *Iod.*, *Hepar*, *Senecio*, *Sepia*, *Sil.*, *Puls.*, *Thuja* and *Sulph.*, for the chronic. Long continuance of the appropriate remedy, is required. Surgical treatment.—Long shaft and large curve, or ordinary sound; the vertebrated bougie is highly recommended in aggravated cases.

Senile Hypertrophy of the Prostate.—This affection peculiar to old age consists of an hypertrophy or enlargement of the natural muscular structure, and incidentally of the glandular. The increase may be but slightly above the normal size, that of a chestnut, to the bulk of a man's fist or even larger. If it affects the whole organ uniformly, the prostatic portion of the urethra will be lengthened; if one side is involved more than the other, the canal will be twisted; if it affects the posterior median portion, the part which lies between the ejaculatory ducts, enlargement of what is called the *middle* or *third lobe* takes place, when the prostatic portion of the urethra is either very much narrowed, twisted or obstructed, or it is extended into a sort of pouch which eventually contains calcareous formations, thereby adding to the sufferings of the patient. *Fibrous* tumors also are developed within the organ involving more or less granular tissue, adding to the constitutional trouble.

The symptoms which are developed are, slowness and difficulty in making water, weight in the perineum and tenesmus. The bladder becomes irritable with frequent urination. The projection formed by the tumor prevents all the urine from being voided, a portion remains behind, decomposes and becomes ammoniacal. Sometimes there is complete retention with its attendant troubles; at others, the mucous coat of the bladder, irritated by the alkaline urine, inflames and secretes a viscid mucus, and finally the kidneys become disorganized; the ureters dilate and the urine continually dribbles away, and the patient dies exhausted. During the manifestation of these phenomena, the constitutional symptoms become more and more marked, fever,

sweats, painful micturition, sleeplessness, and constant urinary irritation wear away the life of the sufferer. Physical examination per rectum, will reveal the nature of the trouble.

Treatment.—The urine if possible, must all be removed from the bladder several times a day by a prostatic catheter. Squires' vertebrated catheter is highly recommended for this purpose.

The medical treatment consists in the use of one of the following remedies according to indications, viz: *Agnus c.*, *Apis*, *Alum*, *Cyclam.*, *Copaib.*, *Dig.*, *Caust.*, *Hepar*, *Lyc.*, *Puls.*, *Secale*, *Selenium* and *Sulph., acid.* The *Iodide of Potash*, *Iodine*, *Puls.*, *Calc. c.*, *Sil.*, *Thuja.*, and *Sulph.* exercise a curative control if given early. See special indications.

Special Indications.—Acon.—with great urging to urinate; great pain in micturition, or in milder cases when there is great pain in walking, especially going down stairs.

Aloes.—Sensation as if a plug is wedged between the symphysis and coccyx, pressing downward; incontinence of urine from enlarged prostate.

Apis mel.—Excessive pain in vesical region; frequent desire to urinate; pressing down in the region of the sphincter; the calls to urinate are both day and night; severe pain in passing urine as if some impediment prevented.

Caust.—Pulsations in the perineum; pain in urethra and bladder after a few drops have passed; spasms in the rectum, with renewed desire for micturition.

Chimaph.—Sensation of swelling in perineum, when sitting down, sensation as if a ball was pressing against the perineum; excessive itching and painful irritation of urethra from the end of the penis to neck of the bladder; prostatic disease, with waste of prostatic fluid; urine thick and ropy.

Conium.—Discharge of prostatic fluid on every change of emotion, with voluptuous thoughts and itching of prepuce.

Copaiv.—Urine is emitted by drops; burning and sensation of dryness in the region of the prostate gland; induration of the prostate.

Cyclamen.—Drawing, pressing pain in the perineum, and in and near the anus as if a small spot was undergoing ulceration; increased when walking or sitting.

Digital.—Fruitless efforts to urinate, or discharge of only a few drops of urine and continued fulness after micturition; throbbing pain in region of neck of the bladder during straining effort to pass water; increased desire to urinate after a few drops have passed, causing the patient to walk about in great distress, although motion increases the desire to urinate; frequent desire to defecate at the same time; very small soft stools passed without relief.

Hepar.—Discharge of prostatic fluid after micturition and during hard stool; also independent of either.

Iodium.—Swelling and induration of the testicles and of the prostate gland; incontinence of urine in the aged.

Kali bi.—Stitches in prostate when walking; must stand still; prostatic fluid escapes at stool; painful drawing from perineum into urethra; after micturition, burning in back part of urethra as if one drop had remained behind, with unsuccessful efforts to void it; stitches in urethra.

Lycop.—Pressing on perineum near anus, during and after micturition; stitches in neck of bladder and anus at the same time; urging to urinate; must wait long before it passes; incontinence of urine.

Ol. Sandal.—With sensation of pain and uneasiness deep in perineum; desire to change position constantly to get relief; stream small and passed with hesitation; sensation of a ball pressing against urethra; pain decreased when walking; increased when standing some time; heaviness in the feet in the morning when first rising from bed: sexual powers weak; erections feeble; urine red and scanty. (Clinical).

Populus.—Enlarged prostate; painful micturition; catarrh of bladder.

Psorinum.—Discharge of prostatic fluid before urinating; frequent scanty urine, burning and cutting in urethra.

Puls.—Painfulness in the region of bladder; frequent desire to urinate, dull stitch in the region of the bladder; spasmodic pains in neck of the bladder extending to pelvis and thighs; faeces flat, of small size from enlarged prostate.

Selen.—Prostatic juice oozes while sitting, during sleep, when walking, and at stool, causing a disagreeable sensation; the same sensation is felt shortly before and after stool.

Staph.—Frequent and copious urination; burning in the whole length of the urethra, when urinating, for many days; frequent urging, with scanty discharge of a thin stream of red-looking urine; urging as if the bladder was not emptied; discharge of dark urine by drops.

Thuya.—Syphilis and sycosis, especially suppressed or badly treated gonorrhœa; stitches in urethra from behind, also from rectum into the bladder.

Escape of urine involuntarily drop by drop: Ara., Bell, Mur., ac., Dig., Petr., Puls., and Sepia.
Difficulty in voiding urine; must press a long time before it flows; Alum., Apis., Hepar, Nuph., Sec. and Tax.
The stream of urine is small: Graph., Olean., Sars., Spong., Staph., Sulph., Tax. and Zinc.
Burning in the neck of the bladder while urinating: Cham., Nux., Petr. and Sulph.
After micturition desire continues: Bar. c., Bov., Calc., c., Caust., Dig., Merc., Ruta., Staph. and Zinc.
Impossibility to urinate: Dig., Sepia.
Continued desire to urinate: Amm. c., Apis., Bell., Canth., Copaib., Dig., Iod., Merc., Mur. ac., Phos., Puls., Sep., Scilla., Sulphur and Thuya.
Pulsation in perineum: Caust. Heaviness in the perineum: Copaib and Graph. In favorable cases prostatis ends in resolution. Badly managed cases suppurate, and abcesses extend and perforate into the rectum, urethra or bladder and discharge; other cases assume a chronic form and by exudation, infiltration and deposition of tubercles and cysts produce a permanent enlargement.

SECTION I.

Gonorrhœal Ophthalmia (*Ophthalmia Gonorrhœca*).

Definition.—An acute specific inflammation of the conjuctiva of the eyeball and lids, and characterized by a profuse discharge of yellow purulent matter, similar to that which issues from the urethra in gonorrhœa.

This disease is the most violent, rapid, and destructive to which the eye is subject. Frequently, when the patient applies for relief the eye is irreparably injured, and unless the course of the disease be promptly arrested the eye will be lost.

In this form of ophthalmia, as also in the purulent or contagious variety, there is great danger that the conjunctiva will swell extremely and overlap the margin of the cornea, and lead to its sloughing, apparently by strangulation of the vessels by which it is nourished. When this condition occurs it is called *Chemosis.*

Cause.—The disease arises from the accidental contact of gonorrhœal matter with the eye, and not, as some have supposed, from a metastasis of the disease from the organs of generation to the eyes. In this way, the matter may be accidentally applied to the eye of a healthy person through the medium of cloths, towels, etc. Even children are sometimes thus contaminated. The disease presents similar symptoms to purulent ophthalmia, and to that disease affecting infants.

The disease is usually confined to one eye; if the other be dis-

eased, it is because there has not been sufficient care to prevent inoculation.

Treatment. — *Acon.*, *Arg.-nit.*, *Merc.*, *Bell.*, *Sulph.* (See "Leading Indications for Ophthalmic Medicines," below).

Accessory Means.—Assiduous bathing, fomentations, iced-water compresses, etc.; astringent *collyria*, and sometimes surgical measures.

Leading Indications for Some Ophthalmic Medicines.—Belladonna.—Pain, redness, and swelling; throbbing pain in the temples or eyes; flushed cheeks, glistening eyes, and great intolerance of light. One or more drops of the remedy may be mixed with half-a-dozen tablespoonfuls of water, and a teaspoonful given during the acute stage every hour, and afterwards every three to six hours. Bell. is often required when there are general feverish symptoms; or a few doses of Acon. may precede Bell.

Aconitum.—Ophthalmia, with quick pulse, dry skin, thirst, and when arising from cold. The early administration of this remedy, with the local use of local compresses, will generally promptly relieve and cure catarrhal ophthalmia. For Gonorrhœal ophthalmia Dr. Angel recommends it every hour, with the topical application of ice, or iced-water, and Acon. during the first stage.

Mercurius Sol.—Ophthalmia marked at first by a copious discharge of watery fluid, which afterwards changes to mucus and pus; agglutination of the lids; smarting heat and pressure, with aggravation of the pains when moving or touching the eyes. There is considerable itching and irritation, but not much fever present.

Mercurius Cor.—In the most violent forms of acute ophthalmia with extreme dread of light, or in chemosis, the 1st or 2d dec. att. of this remedy will often cut short the attack.

Euphrasia.—Catarrhal ophthalmia, with profuse secretion of tears, sensitiveness to light, stinging as from sand, and catarrhal inflammation of the frontal sinuses and of the lining of the nose. In simple catarrhal inflammation, profuse lachrymation being the chief symptoms; it often cures without the aid of any other remedy. In severe cases it may be applied locally.

Argentum Nit.—This remedy is especially valuable in the purulent ophthalmia of children, which it cures rapidly and completely, without the local use of the nitrate. It is also valuable in chronic ophthalmia. Dr. Dudgeon highly recommends it as homœopathic to gonorrhœal ophthalmia: two to four grains to an ounce of distilled water; a small quantity of the solution to be introduced under the eyelids with a camel's-hair brush once a day, or every two, three or four days, according to the symptoms.

Phytolacca Decandra.—Itching in the eyes, aggravated by gaslight; chronic conjunctivitis, and rheumatic pains; reddish-blue swelling of the lids.

Arsenicum.—Obstinate ophthalmia in weak, nervous patients, particularly if the secretion be acrid, with burning, tearing or stinging pains in the globe and lids; aggravated by light; paroxysms of pain; violent stabbings in the eye; eyeball feels like a globe of fire.

Phosphorus.—Chronic and obstinate cases which have resisted the usual remedies, with sensitiveness to light, heat and itching of the eyes, sudden attacks of blindness, black spots floating before the eyes, and secretion of viscid mucus.

Ac.-Nit.—Purulent ophthalmia; swelling and redness of the mucous membrane and lids; secretion of viscid mucus or pus; burning and smarting in the eyes; photophobia; nightly agglutination; and pains in the bones and parts around the eyes. Ac.-Nit. is required in cases originating in syphilis, or aggravated by mercurial preparations.

Gelsemium.—Squintiug; desire for light; orbital neuralgia.

Pulsatilla Nat.—Eyelids agglutinated; increased secretion of tears; neuralgic pains in the eyeballs.

Hepar Sulph.—Similar cases to Ac.-Nit., which it may follow, if necessary.

Arnica.—Inflammation affecting either the mucous membrane, or the deeper structures of the eye, from mechanical injuries. In addition to its administration, the eye should be bathed with a lotion of Arnica (twelve drops to four tablespoonfuls of water). After well bathing the eyes, a piece of lint or linen should be saturated with the lotion, applied to the eye, covered with oil-silk, and secured by a handkerchief.

Additional remedies.—*Sulph.*, *Sil.*, *Puls.*, *Lyc.*, *Aur.*, *Rhus*, *Spig.*, *Tussilago pet.*, *Thuya*, *Macrotin*, and *Euphorbin.*

Accessory Measures.—In the treatment of the various forms of ophthalmia, with weak and imperfect vision generally, the cause of the disease should be correctly ascertained, so that they may, as far as possible, be guarded against or removed. Patients in crowded and unhealthy towns should resort to the country, at

least for a time, where they may take daily out-of-door exercise, and enjoy a pure, bracing air. Frequent, careful, tepid washing of the eyes to prevent accumulations of matter; the occupation of a spacious well-ventilated apartment; and avoidance of all causes likely to keep up the inflammatory process, are necessary precautions. The food should be plain and nourishing; coffee and fermented drinks being excluded; the habits early and regular, and frequent bathing should be practised. A small *wet compress*, covered with oil-skin or india-rubber, worn over the nape of the neck is a valuable counter-irritant when the more violent inflammatory symptoms have been subdued; it is also useful in obstinate cases. The alum curd poultices I have used with good results.

Gonorrhœal Rheumatism differs from ordinary rheumatism in that it follows one or more attacks of gonorrhœa. It has pain, swelling, weakness, and rigidity of the *larger* joints and overlying muscles. The knee joint is most frequently attacked; motion increases pain; the affected parts are inclined to become cold; are sensitive to damp and changeable weather; fever and pain are not so marked as in ordinary arthritis; generally occurs toward the decline of gonorrhœa. Attacks in preference young people of a delicate strumous habit.

Treatment.—The remedies are: *Ac.* or *Gels.* in the first stage, subsequently, *Bry.*, *Clem.*, *Kali jod.*, *Kalm.*; aggravated by motion, *Mezer.*, *Sarsap.*, *Sulph.*, *Thuja.*, *Cimicif.*, *Euphorb.*, *Rhus*, *Sep.*, *Stram.*, *Verat.*, and *Phytol.* The hot springs of Arkansas are highly beneficial.

Special Indications.—Acon.—During febrile disturbances; when the large joints are affected with little rigidity; when the heart is attacked with congestion and a sense of anguish; in rheumatism of the shoulders.

Bry.—When the lower limbs are affected; severe pains in the joint; heat and dryness of the parts; severe pains shooting down the limbs; shining, red swellings; greatly increased by motion.

Arn.—Stiffness in the large joints; tearing pain in the smaller joints, with a tearing, bruised sensation.

Caust.—In rheumatic swellings and stiffness of joints; enlarged joints with tophi; contraction of tendons; shooting and tearing pains, especially in chronic cases, and scrofulous patients.

Cimic.—Local forms of rheumatism, with muscular implication; heart affections; wandering pains.

Rhus tox.—When sheaths of tendons and muscles are most affected; tightening, lameness, tearing, bruised and sprain like pains in the larger joints; aggravated at night by the warmth of the bed, or when beginning to move after rest; lessened by gentle and continued motion; chronic thickening of joints; affection of periosteum.

Rhodod.—Pains worse during rest, in the warmth of the bed, and with every unfavorable change of the weather, especially when easterly winds prevail; swelling and redness of both large and small joints; tension and rigidity.

Puls.—When ankle, instep, or knee is affected; fugitive pains in various parts of the body; pains moving from one point to another, especially in females with menstrual irregularities.

Merc.—Puffy swelling of joints; pains deep-seated in the bones or joints increased by warmth and at night; profuse perspiration which do not give relief.

Phytol.—Chronic cases, with swelling and stiffness of joints, even to loss of motion in the limb; when periosteum is implicated. Consult Guaic and Mez.
Sulph.—After remedies when improvement halts; to complete the cure begun by another remedy; hereditary taint or when associated with eruptive disorders.
Ledum.—Rheumatism of small joints, fingers and toes; chilliness.
Bnle.—Rheumatism from exposure to wet, changes of weather from dry to damp increases pains; relieved by rest.

Colch., *Coloc.*, *Bell.*, *Kali bi.*, *Ranunc bulb.*, *Mang.*, may be advantageously employed as accessories.

Rheumatic patients should always wear flannel and warm clothing to guard against atmospheric changes. Protect the feet from cold and damp. Occasionally warm salt-water, vapor or hot air baths, are very useful. Diet should be easy of digestion, and all condiments avoided.

Gonorrhœa in Women is a much less formidable disease than in men, arising from the fact that the parts inflamed are comparatively less sensitive, more expanded and structurally more simple.

Symptoms are much less acute than in males, and it is much more apt to degenerate into a chronic gleet. Complications are bubo, and ulceration of the neck of the womb. The discharge may proceed from either the external parts; the labia, nymphæ, meatus urinarius, vagina or from the cervix uteri; when it involves the cervix it will be associated with superficial ulceration; differentiate carefully between it and leucorrhœa, and the various discharges that follow simple derangement of the uterus and urethra. Verminous affections produce purulent discharges of the vulva in young girls. The presence of urethritis accompanied with acute inflammation are the strongest symptoms of gonorrhœa. Frequent desire to pass water. The speculum should be employed in all doubtful cases.

Symptoms—There is urgent desire to pass water; heat, burning, swelling, and discharge, muco-purulent, and offensive; attended with swelling and irritation of the clitoris, the mucous membrane is reddened and tumefied, with high inflammatory action.

It occurs under four forms, gonorrœal *vulvitis*, *urethritis*, *vaginitis*, and *uteritis*.

G. vulvitis is where it attacks the external organs of generation; the symptoms are heat and pruritus; the mucous membrane is of a deeper red than usual, moist and slightly swollen, and it is fol-

lowed by scalding on urinating, bearing down pains, and a feeling of weight in the external genitals. The discharge at first albuminous, assumes soon a purulent character; irritating and offensive, which occasionally gives rise to nymphomania, a most distressing complication. Small abscesses sometimes form in the vicinity of the vulvo-vaginal glands.

G. urethritis.—This is rarely met with in the female as a distinct affection; it is associated with vulvitis. It is indicated by a burning urethral pain, intensified during micturition; the discharge is slight; lips of the meatus red, swollen and painful. The finger introduced per vaginam detects a thickening of the urethra; upon pressure against the pubic arch, it feels like whip-cord; abscesses somtimes form in the vagina and perineum, and the glands of the groin enlarge and suppurate.

G. vaginitis.—This is the most frequent seat of the disease, the membrane looks red, is hot, and devoid of moisture; itching, smarting pain exists, with frequent micturition; the vagina feels hot and puffy, and soon there exudes a large quantity of yellow, or greenish, muco-purulent matter. In a few days the discharge diminishes and the disease becomes chronic and difficult to cure. The anterior half of the vagina immediately under the arch of the pubis is the part most affected, which presents an aphthous appearance when examined with the speculum.

G. uteritis.—Vaginitis extends sometimes to the internal surface of the uterus when it becomes a severe disease and difficult to manage. The ovaries may become implicated, the general health undermined, and the reproductive processes interferred with. The os becomes excoriated, the uterus congested, and there exudes from it a gleety, whitish matter, offensive and at times quite abundant. The diagnosis between it and leucorrhœa can only be made in some cases by inoculation.

For vulvitis, *Ac.* and *Merc.*, in the acute stage; *Thuja* and *Sulph.*, in its chronic form. For vaginitis, *Ac.*, *Bell.*, *Merc.*, and *Puls.* in the acute form; *Sepia* and *Kreasote* in sub-acute varieties. For urethritis, *Ac.*, *Can.*, and *Canth.*, in the active stage; and *Copaib.*, *Petros.*, *Cubeba.*. and *Sulph.* in the chronic. For uteritis, *Ac.*, *Canth.*, *Nit. ac.*, and *Merc.*, for the acute type; *Sepia*, *Platin.*, and *Alum* for the sub-acute. Great cleanline

warm fomentations, and medicated lavements of *Alum*, *Hyd.*, *Tannic ac.*, and *Borax*, will be found very servicable during treatment.

Treatment is the same as that recommended for the male. Frequent ablutions and injections should be employed; the vagina well distended with the injection is an important auxiliary in the treatment, and should be insisted upon. The fountain syringe and the vaginal douche is one of the best instruments for purposes of injection. Hip baths are valuable auxiliaries. The temperature should be regulated according to the feelings of the patient. Hygienic measures should be rigidly enforced, and sexual congress prohibited for at least ten days after all evidence of the disease has passed away.

SECTION II.

Chancroid is the simple, soft, non-infecting sore, or local contagious ulcer, unaccompanied by any prominent and perturbating influences in the system. The recent developments of the disease, and the present unsatisfactory condition in which its kin disorder, *chancre*, is held by those who have had abundant means of observation, and the many theories propounded, in reference to its course and effects, are evidences of the still undetermined nature of the disease, and the progress made towards a keener realization of its true character.

Pathology.—The period of incubation is short, say from 24 hours to the third day after infection. It begins as an ulcer which develops immediately after absorption of the poison. Its shape is round or oval, and only becomes irregular from fusion of multiple pustules; the edges are clean cut, perpendicular, often everted and undermined, seldom single; is rarely present except on or near the genitals, is of a yellowish color with a reddish areola around the sore; is auto-inoculable; is situated in the sulcus between the prepuce and the glans, particularly at the

sides of the frenum. The base of the ulcer is soft, can be lifted up from the structure lying beneath, and is easily compressed between the fingers. The lymphatic glands in the groin (bubo) soon become inflamed and usually suppurate; toxic elimination follows, and the system escapes contamination. Four varieties of bubo are presented, the *simple*, *indolent*, *virulent*, and *spontaneous*. The three former are of the venereal type; the latter may be produced by a strain, cachexy, local injury, or indolent ulcer on the leg. Rarely the sore spreads deeply and rapidly, and this only when mercurialization has been produced, or when a peculiar constitutional dyscrasia exists in connection with the chancroid.

About two-thirds of all chancroids remain purely local, the other third is attended with bubo, which may be either inflammatory and resolve itself, or indolent and suppurate. The term bubo I shall apply to enlargement of any lymphatic gland in the body having for its immediate cause a recent venereal ulcer. It is more common in men than in women, and in strumous, lymphatic constitutions, rather than in those of a vigorous type. In the *simple* bubo as a rule, only one gland is affected; it occurs early, within a week or two after the chancroid is developed. It begins with a sensation of stiffness in the groin; is sensitive to pressure, and painful from walking and ascending stairs. The pain keeps pace with the increasing enlargement; becomes red and œdematous, and soon a central soft spot appears, indicating suppuration, and if left to itself opens and discharges.

The *indolent* bubo occurs in impaired constitutions; it grows slowly, involves the neighboring lymphatics, and all become matted together by inflammatory changes into a compound tumor. Increasing in size, it presents a livid, shining, dead hue, sometimes smooth, œdematous and increases to the size of an egg, occupying the folds of the groin. Its course is variable; at times it becomes peri glandular when it opens through the skin with one or more small perforations, which discharge a small amount of sanious fluid containing a few pus corpuscles. The glands do not break down, but the discharge may continue for months and even years if not attended to, leaving rigid fistulæ to discharge interminably.

The *virulent* bubo is a subcutaneous chancroid, and is a violent form of the indolent type, and when opened to the air, its true chancroid characters begin to appear. The cut edge of the skin is immediately inoculated and the whole cut border ulcerates, and the opening grows larger by being eaten away by the advancing ulceration. The borders of the ulcer become hard, livid and undermined; the integument adjoining the ulcer assumes a dusky, purplish hue and sloughs away. The floor of the abscess is uneven, pultaceous, irregular, worm-eaten, and discharges an ill-conditioned pus, inoculable upon the sufferer. It has all the appearances of a true chancroid, and is subject to all the conditions and complications to which a chancroid is liable. Phagedena may attack this kind of bubo in either the sloughing or serpiginous form, the latter of which is the most common. Its course usually is upwards over the abdomen, destroying the connective and cutaneous layers down to the deep fascia, sweeping away everything except the glands, leaving a raw ulcerated spot in the groin and over the abdomen as large as the hand.

The *spontaneous* bubo is a simple lymphangioma arising from a strain, fatigue, struma, cachexy, local injury, etc., and has no connection with either chancre or chancroid. Its accidental position in the groin only gives it interest in a differential point of view from the general bubo.

For the treatment of these ulcers consult the chapter on ulcers, and special indications for the remedies demanded for each, page 21.

Treatment.—Local treatment consists in touching the ulcer in the early stage, or pustule when first discovered, with strong nitric acid, and light dressings of *Calend.*, *Acid nit.*, or *Hydrastis.* The constitutional remedies are: *Acid nit.*, *Acid carbol.*, *Ars.*, *Caust.*, *Merc.*, *Carbo. veg.*, *Cinnab.*, *Kali bi.*, *Lyc.*, *Phos. Ac.*, *Sepia*, *Sil.* If the inguinal glands become inflamed they must be treated the same as inflammation of glands under other circumstances, by hyperdistension, etc. Whenever the system is impaired by any cause, attention should be given to its reinvigoration and support. If any complications arise, such as phagedena, any of its varieties, which is rare now-a-days, good results may be obtained by the internal use of *Ars.*, *Carbo. v.*, *Brom.*, *Kali chlor.*, *Graph.*, *Nitric* and *Sulph. ac.*, *Stilling.*, *Tart. emet.* For hospital gangrene, special indications, page 27.

Mixed Chancre is a combination of chancroid and syphilis; each sore runs its course and the compound lesion possesses characteristics of both. The existence of the chancre offers no protection against the invasion of chancroid, and vice versa, and neither affection interferes with the progress of the other, this is a rare form of the disease, and the treatment must necessarily include the local applications adapted to chancroid, and the constitutional remedies employed in syphilis. See special indications, page 99.

Syphilis.—The recent investigations of this hitherto dreaded disease have proven its present mildness as compared with the former virulence that marked its existence. Mr. Keys speaks of it as "a disease of magnificent exceptions, full of absorbing interest," and *Prof. Dana says "that the disease is not so virulent now as it was during the century when it first conspicuously appeared," and all authors agree that its severity from some *cause* has abated. To what is this cause attributed? To my mind the answer is, that the wide spread dissemination of the disease throughout the world, and the almost universal prevalence of its hereditary characteristics, have established an immunity from its severe attacks, just as vaccination wherever practised, has given protection to the heretofore deadly ravages of small-pox. This, coupled with the fact that professional men have been gradually lessening the poisonous quantities of mercurials given to cure the disease, has in my opinion done very much to strip this disorder of the horrors with which it was associated during the reign of the crude, destructive doses of mercury. It is true that the *type* of the disease whenever manifested proves that its nature has not changed, its features have not altered; but its sting has become less virulent, and consequently less dreaded. There is no question of the fact, that of all people, occupations, or trades, there are none in whom the manifestations of syphilis would be more prominent, its characters more universally displayed, than in the seamen of this and other countries. Yet we

*Prof. Charles L. Dana, on the Benignity of Syphilis.

observe among this class such a mildness in syphilitic attacks, such exemption from the virulence of the past, such an immunity from its constitutional characteristics that we are forced to accept the doctrine of its growing moderation and agree with Prof. Dana. First: That syphilis, as a rule, runs a very mild course indeed, among American seaman, and physically incapcitates them less than either soft chancre or gonorrhœa, with their complications and sequelæ. Second: That it runs this course often without treatment, and almost always in spite of irregular living and unhygienic surroundings.

Symptoms.—The initial lesion of chancre begins as a papule, generally single, or an erosion with indurated areola; it either remains to the end, or the papule bursts, and an ulcer with a hardened base is the result.

The virus has a lengthened period of incubation (15 to 25 days) before development of the papule. It is usually circular; its edges are smooth; not undermined; often elevated and adherent, and gradually melts into the shining floor of the ulcer. It may exist on any part of the body, but more frequently on the genitals. Its secretion is scanty and serous in character, unless irritated when it assumes a purulent form. It is not auto-inoculable. One attack exempts from subsequent invasion; it is peculiar to man; is seldom phagedenic, and shows little disposition to spread; is slow in development but heals rapidly when once reparative action begins. The affection of the inguinal glands is usually *painless*, *multiple*, and *rarely ends in suppuration*, unless due to extraneous causes. The disease, though at first manifesting local trouble may become constitutional, and then the person can never be inoculated with the virus of the chancre. "The proportion of chancre to chancroid is about 1 to 3," says Dana, in his reported tables of the U. S. Marine Hospital service, and according to the tables of Dr. King, the mortality from syphilis was 1-40 of one per cent. From a return to the House of Commons of all the deaths from syphilis in the *workhouses* in England and Wales, beginning in the year 1875, there are only eight per million.

DIFFERENTIATION BETWEEN TYPICAL CHANCROID AND CHANCRE.

CHANCROID.	CHANCRE.
1. Nature and cause.—*A local tissue disease*, caused by *contamination with chancroid pus in sexual intercourse;* auto or hetero-inoculation of chancroidal pus.	1. A *general blood disease, caused by contamination with syphilitic virus in sexual intercourse;* hetero-inoculation of the chancre virus upon a non-syphilitic person.
2. Situation.—*Upon the genitals or in the groin;* very uncommon elsewhere.	2. *Upon the genitals;* not unfrequent upon the lips, nipples and fingers; very uncommon elsewhere.
3. Number.—*Often multiple, both in origin, and by spontaneous auto-inoculation.*	3. *Generally single*; sometimes multiple from the start; not usually spreading by spontaneous auto-inoculation.
4. Second attack in same individual *entirely possible.*	4. *Almost impossible.*
5. Auto-inoculability.—*Always possible in generations.*	5. *Impossible*, unless the ulcer secretes pus.
6. Transmissible to animals.—*Possible.*	6. *Quite improbable.*
7. *Begins as a pustule or an ulcer, and so remains; advances rapidly; heals slowly; no incubation.*	7. *Begins as papule, or an excoriation, and remains an indurated ulcer; advances slowly; heals quickly; has a distinct incubation from 5 to 20 days.*
8. Color.—*Dirty yellowish white, or pinkish with free creamy secretion.*	8. *Livid red or bright blood color, or gray*, with *scanty, serous, sanguinolent* discharge.
9. Induration *absent;* edges perpendicular; floor *uneven and dull*, with *pain.*	9. Induration *invariably present;* edges *slanting and adherent*, with *smooth, bright floor*, and painless.
10. Phagedæna, *an occasional complication.*	10. *A very rare complication.*
11. Bubo *occurs in about ½ of all cases*, either simple or virulent, and painful as a rule.	11. *Invariable and always indolent*, exceptions 2 per cent. of all cases; never becomes virulent; painless as a rule.
12. *No appreciable constitutional contamination.*	12. *Constitutional contamination occurs as a rule.*
13. *Syphilis, as a result of chancroid, impossible.*	13. *Syphilis, as a result of chancre is invariable.*
14. *Local treatment all-important.*	14. *Local treatment unimportant.*
15. A chancroid *may be cured by cauterization* without, and not produce consequent trouble.	15. Chancre *cannot be cured by cauterization*, and not produce constitutional implication.

Treatment.—The remedies which are most successful in curing this disease are the following: *Ars.*, *Iod.*, *Aurum.*, *Badiaga*, *Carbo an.*, *Carbo veg.*, *Cinnabar*, *Corydal.*, *Kali bi.*, *Kali hyd.*, *Lach.*, *Lyc.*, *Merc. cor.*, iod., sol., and Nitric ac.

Constitutional Treatment. The most important of all these remedies are the mercurials, and if we examine into the pathogenesis of *Merc.* we will find that no remedy posesses such a closely related similimum to syphilis. It is upon this very *homœopathic* principle, as Dr. Bumstead reproachfully says

"that the elastic principle of similia similibus is also made to cover" the true curative action of this disease. This "*elasticity*" proves the essential element of the homœopathic law, and its engraftment upon allopathic practice "covers" all that is valuable in that system in the cure of syphilis. With all due deference to some of our friends, who seem better versed theoretically than practically in the treatment of syphilis, I believe, as I have oftentimes asserted, that the mercurials, as a rule, are the only really reliable remedies for the cure of the indurated chancre, and it is through this remedy, properly administered, and diligently continued, that patients are dismissed "cured," without the necessity for their return to the surgeon, as has been sneeringly written by some who preach better than they practice.

Let us compare the effects of syphilis on the human system, with the toxicological symptoms of *Mercury* as given by Pereira, in his famous materia medica, justly accorded as one of the very best works on that branch in the allopathic school:

SYPHILIS.	MERCURY.
Syphilis produces on the skin pustules, scales and tubercles.	Mercury, says Pereira,* produces severe forms of skin diseases.
Syphilis excites inflammation of the periosteum, and caries of the bones.	Mercury produces inflammatiion of the bones and periosteum, says Pereira.
Syphilis produces inflammation of the iris.	Mercury produces a disease called mercurial iritis.
Syphilis produces inflammation and ulceration of the mouth and throat.	Ulceration of the mouth and throat is a well-known effect of mercury, says Pereira.
Syphilis produces enlargement and hardening of the glands.	Mercury produces enlargement of the inguinal and other glands, says Deterich.
Syphilis produces chloro-anemia, a diminution of blood corpuscles and an increase in the proportion of serum.	Mercury diminishes the coagulability of the blood, and increases the proportion of serum.
Syphilis produces ulcers on the genital organs.	Mercury produces ulcers with induration on the glans and prepuce, says Fick, of Hamburg.

* Pereira's Materia Medica, vol. 1, p. 588, et sequitur.

The difference between the two prevailing schools, is simply this, that while homœopathic practice cures the disease "tuto cite et jucunde"; allopathy too often dooms the unhappy victim to all the attendant horrors of mercurial toxæmia, which, according to Mr. Druitt's own confession, is *useless*, except to show that the system is affected. Prof. Gross also remarks: My own opinion is, "that the more simple and gentle the mer-

curial course is the better." Prof. Keys * says syphilis is "a self limiting malady." Prof. Dana † remarks that the disease is innocuous as compared with its early history. Prof. Keys states, that it gets well under all treatment, but yields best to *small doses of mercury*, continued for a long time. Diday remarks that it is cured by the grace of God; that is the do-nothing treatment. Sigmund and Zeissl, two late German authors of high position, render their verdict in favor of Diday's method of treating syphilis. Keys says the question now is how to use mercury, and he settles the matter for the old school, and recommends what he terms the "tonic dose," which is one-half of the "full dose," viz.: 1-12 of a grain of the proto-iodide of mercury, and in *late years*, he has been in the habit of using a much less quantity, for instance, one equal to $\frac{1}{8}$ instead of $\frac{1}{2}$ of the "full dose," which is equivalent to 1-18 of a grain of the crude drug. With this diminished "tonic dose," he adds, that it is given, "rather to his advantage, (the patient) for he feels well under it in most cases; he eats well, his functions go on perfectly, and his blood is richer in red corpuscles than it was before." He also recommends that this dose shall be continued for about "three years," and "a year's freedom from evidences of the disease, is desirable before the tonic is stopped." (This is good similia practice.) I mention these facts, gathered from recent and approved allopathic authority, to show that the tendency in that school is to yield their old and cruel treatment of the ponderable doses of mercury, with all its multiplied horrors, to the minute and all curative remedy of the recognized "elastic" similium. While these things are being done in the old school, to the credit and the relief of poor humanity be it said, I ask what is the position of our own syphilographs upon this important subject. The only two representative authors in the homœopathic school who have written late surgical treatises, including the treatment of this disease, seem to be further from the mark, so far as an intelligent knowledege of the method of curing syphilis homœpathically, than those of our allopathic brethren whom I have previously quoted. One proclaims his belief that the disease *can be cured*, but only in *material doses*,

* Venereal diseases, page 104,

† In a monograph on Venereal Diseases.

oft repeated, and recommends *mercurials* to be employed in the *first trituration*; while the other declares that syphilis is "absolutely incurable," except it be "by the extinction of the sufferer, and the absence of any heirs of his body;" yet in the treatment, the latter gives most profoundly and most unerringly, "*full indications for remedies*," and adds, "the *corrosivus* is the *sole similimum*, so far as my (his) experience goes." How far does that experience go, when the true and "sole similimum" yields up its curative powers and negatively awaits the slow extinction of the sufferer. With all due deference to such authority, I still believe as before stated, that mercurials are the only real and reliable remedies in the treatment of the indurated chancre and it is through this remedy properly selected and judiciously given, that cases are being continually dismissed as "cured," without the necessity of coming again under the notice of the surgeon. I have "cured" hundreds of these cases both in hospital and civil life in a practice of nearly forty years, by the aid of mercurial treatment, without imposing upon my patients the painful penalties of the remedy or compelling his return for further treatment, and this I have accomplished by the higher potencies. I also believe, that with the higher potencies, there is just as much certainty in "*curing*" this disease, as any other affection in the nosology, and the longer I continue in the practice of prescribing for this disease, the more I am convinced that the higher potencies act the most promptly, the most certainly and most curatively. As a rule, I employ the corrosivus in persons of strong vital reaction, and the proto-iodide, or the solubilis in those of scrofulous systems, dyscrasias, broken-down bodies, and in females. No disease at all equal to syphilis in obstinacy and virulence, yields a more ready response to the indicated remedy than this.

Mixed Chancre.—The *mixed chancre* of Rollet combines both the characteristics of chancroid and chancre. Each sore runs its distinct course, and the compound lesion possesses the peculiarities of both, and the treatment must be adapted to the combined characters. One may be cured before the other is fairly developed, when attention must be given to the remaining sore. The mixed chancre is very rare.

Urethral Chancre is one of the least common of all chancres, and is situated just within the meatus, one of the lips of which

it may involve. It will be felt as a tumor along the course of the urethra, with pain on urinating and during erection. A slight discharge usually accompanies its presence, of a muco-sanguinious character. This may continue for three or four weeks, and there is some danger that the cicatrix may produce a stricture of greater or less importance. The inguinal glands also become affected as in the ordinary chancre.

Chancres in different parts of the body are to be treated in the same manner as those already spoken of.

The Excision Treatment, or rather the attempt to cure syphilis radically by excision of the chancre, is a recent and interesting method of effecting a cure of this disease, based upon the theory that "the poison, after being absorbed, lies latent locally throughout the period of incubation, and then commences to increase in quantity, at first locally. It is unnecessary to enter into a discussion of a theory which is neither sustained by analogy or fact.

Auspitz, a German syphilogist of considerable repute, has attempted to prove the affirmative of the proposition, but on close analysis his statements are unsatisfactory and unreliable.

The inunction method, the vapor bath, fumigation by volatilization of mercury, are dirty, unscientific and dangerous plans of employing the mercurial treatment, and no true homœopath should be induced to try such crude and unsatisfactory measures, when the whole range of mercurials, and their various attenuations are so easily obtained. A rule to guide us in the treatment of true syphilis is the condition of the floor of the chancre. If it exhibits a reddish, unhealthy appearance, or if the color of the spot presents any strong contrast with the surrounding tissue, it is almost certain evidence that the constitutional disease is not completely cured. Treatment should be continued till the original base of the chancre is covered with healthy tissue and no difference is perceptible between it and the contigious structures. The practice hitherto so strongly insisted upon of destroying the chancre by the violent caustic preparations employed, cannot be too strongly reprobated. The destruction of the chancre in this way does not cure the disease already transmitted to the system; on the contrary, it removes a valuable guide in

our treatment, and there is no other way open to us whereby we can determine the condition of the patient, or the progress of the case. The appearance and characteristics of the spot where the chancre existed is the syphilo-metre, whereby we can safely and surely prognose the progressive recovery of the patient, or otherwise. When the caustic agents are employed to destroy the chancre, the systemic contagion becomes more intractable and complicated with the various conditions that develop during the progress of the disease. Confusing and complicating symptoms arise, making it difficult oftentimes to select the proper remedy, and the patient may finally succumb to "all the miseries of ill health," referable to his cruel treatment in the early period of his disorder.

Treatment.—One of the preparations of mercury, given with reference to the constitutional and moral states of the patient, the form, extent and duration of the ulceration must be selected and diligently preserved, etc. The greatest cleanliness locally and generally should be insisted upon; dressings to the local sore enforced, and rest as far as possible enjoined. The following remedies in reference to the progress and persistence of the disease may be given according to their indications, etc., etc.

1. Primary Syphilis.—*Mercurius* (hard chancre); *Ac. nit.* (Sloughing chancre, or if mercury has been given to excess); *Merc. cor.* or *Cinnabar* (combined gleet and syphilis); *Thuja* (warty growths); *Bell.* (inflamed and painful buboes); *Ars. iod.* (buboes, painful and threatening suppuration); *Phyto.. Podoph.*, or *Sulph.* (co-existing chancre and skin affections).

2. Secondary Syphilis.—*Ac. nit.* and *fluor.*, *Eryng. aquat.*, *Merc.*, *Cundurango*, *Iodium*, *Kali chl.* (sore throat and mouth); *Merc. cor.*, *Kali hyd.* (iritis); *Aurum*, *Styllingia*, *Sarsap.* (rheumatic or bone pains).

3. Tertiary Syphilis.— *Kali hyd.*, *Aurum* , *Phos.*, *Ac. phos.*, *Sil.*, *Mez.*, *Asaf.* (nodes and bone diseases—exostosis, caries, necrosis, etc.); *Ars.*, *Ars. iod.* (cachetic ulcers); *Aurum*, *Kali bi.*, *Calc. c.*, *Kali ch.* (ozœna); *Aur.*, *China*, *Phos.*, *Carbo. veg.*, *Ars.* (syphilitic cachexia).

4. Hereditary Syphilis.—*Merc.*, *Ac. nit.*, *Aur.*, *Phyto.*, *China.*, *Ars. iod.*, *Sulph.*, *Iodium.*

Special Indications.—Mercurius sol.—This remedy stands in the front rank among the few that are capable of destroying the venereal poison in the system. Its pathogenesis contains nearly the entire phenomena resulting from venereal infection. It is of special value in primary symptoms, and in inherited syphilis of infants and children. Dr. S. P. Hedges, of Chicago, Ill., has found that whenever it fails to cure, the diathesis of the patient is complex; so that no one remedy will alone effect a cure. It is specially indicated in Chancre with *red* edges, cheesy or lardaceous bottom, *painful*, and readily bleeding. Chancre with indurated base and margin. Erythematous and papular eruption; ulcers in the throat; fauces and tonsils swollen, inflamed and ulcerated; rupia with violent itching; necrosis; emaciation, with slow hectic fever.

Acidum nit.—Constitutional syphilitic ulcerations, especially the inherited ulcerations of children, and when the mercurial Cachexia has been engrafted upon inherited syphilis. Chancre with raised edges, bleeds easily and profusely; pale, flabby, and prominent granulations; ulcers inclined to spread in circumference rather than in depth; fungous growths; discharge corrosive; buboes threaten to suppurate; coppery and violet colored spots on the skin, squamia, rupia, mucous tubercles, condylomata, drawing and pressing pains in the head. Also in primary chancre, with spongy, elevated margins, not painful, but bleeding readily and profusely. The remedy should be administered in both high and low dilutions, and not too hastily abandoned if one dilution has not answered.

In case of sloughy (eating) ulcers, *Ac.-nit.* should be used topically in a low caustic form, and thus will be found to act well with its constitutional administration.

Kali hyd.—No remedy surpasses this as an antidote to the syphilitic poison in the secondary, and especially in the tertiary form of the disease. nodes, gummata, Erythema, tubercular skin eruptions, ulcers on tonsils, periostitis, and coryza are distinctly under its influence. After abuse of mercury, hard bubo in a scrofulous system; ulceration of nose, mouth, or throat, with corrosive burning discharge; lancinating pains in the throat; secondary and tertiary types of syphilis, threatening abscesses, system depressed. The pain of nodes is quickly relieved, and when not very chronic, the nodes soon disappear. According to Ringer, large doses arrest the rapid sloughing of some syphilitic sores, and promote the healing process.

Mercurius cor.—Chancres inflamed and painful; ulcers with a lardaceous floor which secrete a thin ichorous pus; acute inflammatory bubo, secondary symptoms make an early appearance, in iritis with affections of the conjunctivæ, soft, flat condylomatas, mucous tubercles. Chancre, with ichor adhering to the bottom, and discharging thin pus which stains the linen; combined chancre and gonorrhœa; buboes; skin affections; the symptoms being worse in bed, and at night.

Cinnabar.—Similar symptoms to the above occuring in scrofulous, indolent constitutions. Useful in secondary and tertiary forms; chancres with hard base in scrofulous persons; the middle of the chancre is raised and fungoid; indurated bubo; iritis with pain in the supra-orbital region; circular ulcerations of the skin, mouth and throat, ulceration of the tonsils in the secondary stage when the vegetations and mucous patches are the predominant lesions.

Merc. prot.—Painless chancres; when the glandular system is largely implicated, inguinal glands large, swollen, but not disposed to suppurate; affections of the throat, indurated tonsils; secretions small in quantity but tenacious; orchitis following venereal taint.

Acid fluor.—Secondary syphilis of the throat and tongue, or osseous caries, pains in the bones generally.

Cundurango.—Congestion of the schneiderian membrane, extending to the frontal sinus; pimples, pustules and blotches on the skin, especially the lips, giving rise to painful cracks in the corners of the mouth. It first came into notice by an accidental cure of constitutional syphilis.

Arsenicum.—Gangrenous sores, with florid unhealthy granulations, which bleed on the slightest touch, and are painful and burning; or painless ulcers secreting a watery, corrosive, and offensive fluid; rapid emaciation, prostrating diarrhœa; scaly skin, or malignant ulcerations in the secondary or tertiary stage.

Arsenicum-iod.—According to Dr. H. Noah Martin, of Philadelphia this remedy excels all others in the rapid cure of venereal bubo. It quickly reduces and disperses acute swellings of the inguinal and axillary glands, even after the peculiar throbbing pains have set in which seem to threaten suppuration.

Belladonna.—As an occasional remedy, *Bell.* is very beneficial; especially in cases in which there is great pain, redness, and erysipelatous appearance.

Thuja.—Warty growths (Sabina, if they are large, moist, and painful); small warts on the iris; mottled eruptions, condylomatous excresences on the penis, vulva and about the anus, painful inguinal glands; purulent pimples; brown or red mottled spots with itching; red nodosities; rupia.

Carbo veg.—In cachexia syphilitica; extreme prostration; impairment of digestion, suppuration of bubo; parts livid and mottled; falling off of the hair; furfuraceous desquamation; yellow skin, with impairment of digestion, etc.

Carbo an.—Bubo assuming the phagedenic type.

Merc. prec.—When bubo puts on a phagedenic form and the various ulcerative processes become destructive as in affections of the long bones; nodosities with severe pain at night.

Aurum.—Ulceration of the mouth and nose; ozœna, bone diseases, sarcocele. Particularly beneficial when the system has been broken down by the combined influence of syphilis and mercury, and the mind, equally depressed, dwells upon suicidal thoughts. Mercurial cachexy: syphilis in the secondary and tertiary forms; ulcers of nose and mouth, with fetid discharge; necrosis of the nasal bones; nodos-

ities of cranial bones; ulcers and crusts within the nose, with putrid smell; burning and boring pains in the bones.

Sarsaparilla.—Purulent vesicles, itching furiously; various skin affections.

Sulphur.—As an intercurrent remedy in all stages: in superficial ulcer, with a lardaceous base; when the disease threatens to assume a serious form, or is very obstinate; also of special value in sycosis.

Phosphorus.—Affections of the long bones, or the jaw bones; and when a dry cough, burning, stinging pain, bloody expectoration, and great debility, indicate danger to the lungs.

Mezereum.—Exostosis, necrosis, or caries, particularly of the shin-bones, the part feels sore, and is aggravated by touch.

Clematis.—Orchitis, excrescences, scabies, tetters discharging bloody matter; pain and irritation, worse at night.

Accessory Means.—All wear and tear of system, such as overexertion of the mind in business or pleasure, must be avoided. Generous but plain diet, and avoidance of stimulants; comfortably-warm clothing, rest, fresh air, and moderate daily out-of-door exercise, and other good hygienic surroundings are essential. Generally, a warm bath about twice a week, at bed-time is advantageous; also daily cold or tepid sponging, with abundant friction by means of a *Bath-sheet*, on rising. The importance of thorough *cleanliness* in this disease may be inferred from the fact that some of the worst cases of primary disease have been successfully treated by prolonged warm baths. The septic discharge being removed as soon as formed, the sore heals much more rapidly than under ordinary circumstances. Cleanliness is not only valuble curatively, but, practised thoroughly and immediately, is the best *prophylactic*. The abstinence of tobacco and all stimulants should be insisted on.

In those patients who for a long series of years have been addicted to the daily use of stimulants, it is recommended that they be not entirely and suddenly deprived of them, but that they be used twice a day in diminished doses with their meals rather than upon an empty stomach. High livers, on the other hand, should be restricted in the quality and quantity of food, and be brought as soon as possible to a plain, unstimulating but nutritious regimen. The influence of the mind upon the body is nowhere more clearly witnessed than in Syphilitic patients. It is advised, therefore, that the surgeon be frank and candid in regard to the curability of the disease; not buoying him up with hope of a speedy recovery, which is sure to be followed by disappointment and chagrin, nor yet delivering a gloomy prognosis, dooming him to utter and unconsolable despair. There is no disease that produces such a profound impression upon the system, even to the complete wrecking of all functional and organic

action, as *Syphilophobia.* To prevent this, the surgeon should be frank at the outset, and assure the patient that, though the cure may be protracted and that it may even be subject to modified relapses, yet the treatment, if persisted in, will ultimately restore him to health and constitutional vigor.

As a rule, simple lint soaked in tepid or cold *Calendula* water, and renewed every three or four hours, is the only application required for the local sore. But for primary sores and ulcerated glands (*Bubos*), a solution of twenty grains of *Chloral Hydrate* to one drachm of water is exceedingly beneficial. The healing process is regulated and hastened, and auto-inoculation prevented by its use. *Powdered Chlorate of Potash* is another valuable local remedy, especially for removing fœtor and hastening healing. The powder should be sprinkled over the open sores, and covered with a wet compress. As topical applications in sloughy ulcers *Carbolic acid*, and *Ac. nit.* have been already recommended.

SECTION III.

Constitutional Syphilis.—When the poison of syphilis has infected the system it produces certain symptoms, which develop at variable periods, from two weeks to six months or more after the primary disease. The skin and mucous membranes first become affected, afterwards the bones and internal organs. The result is rarely fatal, unless the brain or other vital organ is affected. When once involving the system, it is difficult to entirely eradicate it, and in the earlier periods it may be communicated by means of the saliva, the milk, or even the discharges from secondary sores; later in the disease the poison seems more localized and is less prone to be eliminated from the blood.

Syphilides.—The syphilitic eruptions on the skin, correspond quite closely to the ordinary cutaneous diseases. They are all characterized by a *dull, copper-color areola*; are grouped together, and possess a circular shape; *do not itch*, and leave behind a *brownish stain* or *discoloration* which remain sometime after their complete cure.

Mr. Keys gives ten varieties of eruptions named in accordance with the prominent lesion which characterizes them, viz.:

1. The erythematous syphilide (roseola).
2. Pustular syphilide.
3. Papular syphilide.
4. Vesicular syphilide.
5. Pigmentary syphilide.
6. Squamous syphilide.
7. Tubercular syphilide.

These various forms of the syphilides, owing their origin to the same poisonous contamination are to be treated very much in the same manner; so also will the *mucous tubercles* which occur near the orifices of the mucous canals, especially where the parts are bathed in perspiration, and where irritation is kept up by more or less movement. They form small, soft, flattened tumors which secrete a thin offensive discharge.

Syphilitic Ulcerations.—The mucous membrane of the pharynx is subject to a peculiar foul, excavated ulcer, with ragged edges and covered with a grayish, yellow slough. The inside of the mouth, lips, tongue and even the larynx are liable to be affected by syphilitic ulcerations. Ulcers upon the legs beginning as small gummy tumors, soften, break and form deep ulcers, characterized by its circular form, its clean cut edges, irregular base and unhealthy discharge. They occur generally about the knee joint.

Syphilitic Osteitis.—The bones most frequently affected in constitutional syphilis are the tibia, clavicle, ulna and bones of the skull. It may begin either in the periosteum, or in the bone itself as a slow inflammation. The affected part is exquisitely tender, with great pain, *aggravated at night.*

Syphilitic Nodes.—By degrees an oval tumor is developed, (a node) which at first feels doughy, but afterwards becomes distinctly fluctuating. If left alone it gradually involves the skin and bursts, exposing the ulcerated bone beneath. If situated on the skull, it may produce meningitis and death, or it may involve the brain, by distroying the inner table of the skull, the brain protruding through the opening made, with the serious results that ----ly follow this condition. Syphilis of mucous membranes

usually occur late in the disease, but may take place during all its stages. They appear in the mouth, throat aud nose. 1st. As erythematous patches with erosions and superficial ulcers. 2d As mucous patches which appear late. 3d. Scaly patches. 4th. Gummatous ulcers which also come on late in the disease.

Treatment.—The treatment of all constitutional contaminations by syphilis is referred to the complete eradication, if possible, of the primary source of the mischief, are those mentioned on page 98, and the same general directions as to diet, hygiene, etc., etc., must be thoroughly followed.

Constitutional Remedies.—For the constitutional effects of syphilis the following will be found to answer almost every conceivable condition: *Ars., Bell., Berb. vul., Cinnab., Carbo an., China, Cordal., Hepar, Hecla l., Hydrast., Kali bi., Iod..Merc. cor. jod. et. sol., Mez.. Nit. ac., Phos. ac., Phytol., Sepia, Sulph., Syphilin., Thuja.*

For the syphilodermata: *Ars., Ars. jod., Aur., Nit. ac, Graph., Hepar, Kali bi., Kreas., Phytol., Merc. jod, et cor., Rumex., Lach., Lyc., Syphilin, Tart. emet.*

For syphilitic periostitis, nodes and ostitis: *Asa., Ars., Aur., Ac. fluor., Calc. jod., Hecla la., Kali jod., Merc. cor. jod. et sol., Mez., Nit. ac., Sil., Staph., Still., Syphilin.*

For syphilitic iritis: *Ars. jod., Atrop., Bell., Cinnab., Colch., Kali jod., Merc. cor. jod. et sol., Nitric ac., Spig., Syphilin.*

For syphilitic laryngitis: *Ars. jod., Hepar, Kali jod. et Ioc, Syphilin.*

For gummatous lessions: *Ars. jod., Iod., Calc. jod,, Merc. jod., Syphilin, Sil.*

Locul Treatment.—The local treatment should be simple and non-irritating to the external manifestations. *Hydrast.*, and *Merc. sol., Calend., Carbol. acid.*, and *soda bi borate* lotions have in my hands done effective service.

For gangrenous ulcerations: *Ars., Lach., Ac. carbol.* See special indications, page 99.

Infantile Syphilis.—If either of the parents are syphilitic. the infant may inherit the disease. If the father is contaminated he may transmit the disease to the fœtus directly, at the time of conception, and the mother may be infected through her

offspring; or he may communicate it to the mother and she may infect the child; or if the mother alone is syphilitic, the fœtus may become affected during intra-uterine life, through the blood of the mother. Under such circumstances, the fœtus is apt to die about the fourth month, which ends in miscarriage. Repeated miscarriages, without some overact, at once suggests syphilitic contamination. Under more favorable auspices, the child may be either born alive, thin and shriveled, with a prematurely old expression, a hoarse voice, a snuffling breathing, nasal discharge, and perhaps covered with a scaly eruption; or it may be born apparently healthy, and the syphilitic symptoms develop a month or two afterwards.

Treatment.—The infant should be removed from the breast and be brought up by hand, that it may not imbibe further poison from its mother, or infect a hired nurse. This having been done, either of the following remedies may be employed in accordance with their pathogenesis, and the characters of the case: *Fer. jod.*, *Calc. carb.* and *jod.*, *Hepar*, *Kali jod.*, *Merc. jod.*, *Mez.*, *Lach.*, *Nit. ac.*, *Phytol.*, *Sang.* and *Thuja.* The utmost importance should be given to those general hygienic and dietetic principles that are so imperatively demanded in all cases of blood poison and otherwise depraved systems.

SECTION IV.

Spermatorrhœa, or seminal flux, is chiefly met with in young men, usually from the ages of 18 to 30 years, and is commonly the consequence of that terrible vice, which practiced in solitude emasculates the body, enfeebles the mind, and degrades the moral status of the mind to a condition of absolute loathing, and disgust of self. The generative organs seem to be impressed with a dual mixture of irritability and debility; the testes are excited into erection by the simplest causes; a look, a thought, the gentle motion of a carriage, or the effort at stool, will pro-

duce a feeble ejaculatory effort, a few drops passing the urethra. From two to four emissions during the week, or oftener in the more advanced stages mark the debility of the organs, and the irritability that invests them. In a short time, the physical and mental powers suffer; the face is pallid, sallow and anæmic; there is ringing in the ears, dyspepsia and emaciation; the features are drawn; expression is listless; eyes lifeless; spirits depressed to the very verge of despondency and despair. Coitus is impracticable as the gush of semen takes place either before erection occurs or without its occurrence, the most melancholy forebodings ensue and the patient is dragged down to the very depths of degradation and moral discomfort.

Causes.—Self abuse; morbid conditions of the urethra; irritability of bladder; constipation; rectal irritation; ascarides; hæmorrhoids; prolapsus ani; elongation of prepuce; frequent excitations of the passions without natural gratification; sexual excesses; excitation of the sexual organs from novel reading, etc.

Treatment.—The curative treatment consists in the use of those agents which, while they diminish irritability, invigorate and strengthen the genito-urinary organs. Happily for humanity homœopathy offers a rich materia medica for the various conditions and varieties of this truly pitable disorder, among the most valued of which are the following: *Anac., Aur., Agnus c., Bell., China, Camph., Bufo., Brom., Calc., Canth., Eryng. aq., Cobalt, Gels., Digit., Ferr. brom., Phos., Phos. ac., Plat., Puls., Iris ver., Nux vom., Kali brom., Nuphar. lutea, Selen., Staph., Sepia, Ustilago., Zinc ox., Sulph.* See special indications at the end of this chapter.

Local Measures are the cold salt-water sitz bath, every night and morning, or the cold shower bath, light bed covering, and a hard mattress, light suppers, entire absence from all highly seasoned food, wines, liquors, tobacco, etc.; properly directed exercise, ventilation, a well regulated diet, electricity, the pleasant occupation of the mind, the avoidance of stimulants, and of all enervating habits, and above all the cheering effects of pleasant society, pursuits and amusements. A suspensory should be worn constantly, and a knotted towel, the knot to the spine, should be tied around the body, so that the patient will be

awakened by the pressure whenever he lies over upon his back. The wet girdle at nights, the spermatic ring, and electricity are valuable expedients.

Impotence is often met with in persons ordinarily healthy, and in some cases where great muscular power exists, and arises from either a natural deficiency in individual organization or from exhaustion of the nervous power by habitual mental or physical exertion; by excessive sexual indulgence, over exercise, or study, carried to an intemperate degree.

Asperma is very rare except in cases of atrophy, absence of the testes or organic degeneration of their structure. It has been observed that each individual possesses a certain given amount of procreative power, which being early exhausted or habitually wasted by frequent intercourse, can be restored partially only by such attenuated remedies as have a decided penchant for these organs. Among the remedies are: *Agnus. cast.*, *Anacar.*, *Berb.*, *Bufo*, *Calad.*, *Con.*, *Gels.*, *Phos. ac.*, *Papay.*, *Selen.*, *Staph.*, *Ustilago.* Other general and local treatment, as recommended under spermatorrhœa, should be entertained during treatment.

Marriage.—This important question, so frequently referred to the practitioner, as to its curative value, is hereby presented for future guidance.

1st. If spermatorrhœa exist in the *spinal* or *cerebral* form, marriage is injurious.

2d. If the disease exists in its general form mainly, and the act can be consummated without injurious consequences to the patient, although imperfectly, marriage may be advised.

3d. As a rule, marriage should not be recommended as a curative remedy.

Special Indications for Spermatorrhœa.—Merc. v.—Impotence from abuse of sexual organs.

Ferr. met.—Impotence from abuse of sexual organs in weak people; great debility following the discharge, and nocturnal emissions.

Stilling. and Nux v.—Caused by masturbation or abuse of alcoholic liquors, coffee, sedentary habits and mental exertion.

Plumbum.—With a relaxed penis, after drinking wine, with lassitude next morning; violent painful erections from the least excitation.

Gelsem.—From relaxation, weakness and irritability of the seminal vesicles.

Bell.—From weakness of the seminal vesicles, with sweating of the sexual organs, and pressing and lacerating pains in the parts; indifference to voluptuous excitement; sexual desire extinguished; sadness with increased sexual desire.

Selen.—Itching and coldness of the genitals; nocturnal emissions, with amorous dreams; the semen escapes with every stool, and after urinating; dribbles away unperceived during sleep; is very thin, and odorless; he is hopelessly distressed.

Ustil. m.—With erotic amorous dreams.

Ferr. brom.—Great debility, anæmia and depression of spirits.

Canth.—With great impotence and inability to retain the urine.

Nuph. lut.—With painless morning diarrhœa.

Sep.—*Mental symptoms*; after coitus, anxious and restless all day; discouraged and easily frightened in the evening; vertigo.
Ant. cr.—After lascivious fancies, less sexual desire.
Phos.—Cerebral excitement, with flushed face and glistening eyes; satyriasis.
Stram.—Depression of spirits, with spermatorrhœa; great delirium; sexual excitement during the night; during mental derangement; sexual irritation.
Diosc. vill.—Depression of spirits; great weakness of the knees after pollution, without erection; sensation or dreams.
Nat. Carb.—Dissatisfied and vexatious; out of humor after painful emission.
Nat. mur.—During lascivious thoughts, without erection; profuse discharge of prostatic fluid.
Lyc.—Exciting imagination even causes no erection, although there is sexual inclination.
Digit.—Frequent lascivious fancies, day and night.
Ham. virg.—Gloomy and depressed mood after emissions, with amorous dreams.
Until. m.—Great despondency and irritability of the mind, with great dispondency; great prostration and great pain in the lumbar region the day after an emission, with sexual dreams; erotic ideas, fancies, and amorous, with seminal emissions, and spermatorrhœa.
Thuja occ.—Heaviness and ill-humor after emissions.
Selen.—Hopelessly distressed, semen escapes with every stool, and after urinating.
Con. m.—Hypochondriasis from denial of sexual intercourse; among single men; **sad, anxious,** low spirited; suppression of sexual desire.
Staph.—Indifference, low spirits, and dullness of mind after onanism.
Ign.—Lascivious and amorous fancies, with exalted sexual desire; weakness of the parts, and impotence, and sexual fancies and dreams.
Mere. v.—Excitement with painful nocturnal erections, with tension seemingly caused by flatulence.
Ambr. gr.—Amorous imaginations, without irritation of the sexual organs.

Silicea.—Thoughts with sexual desire very much excited day and night, with frequent erections, and drawn up testicles; ill-humor and irritability after coitus.
Calc. sep.—Lewd thoughts without erections.
Calc c.—Nervous relaxation; discontent, and irascibility, with trembling and great weakness in the legs, principally in the knees; ill-humor and dissatisfaction.
Graph.—Thoughts run on sexual subjects, tormenting him so that he fears insanity.

Syphilitic Ostitis and Periostitis.—The bones and also their coverings may be involved in constitutional syphilis, also the ligaments and joints, attended by pain, fever, nocturnal exacerbations. Gummy deposits take place in the capsule of the joints in a diffused form, producing thickening, weakness of the joints and finally loss of motion. Osteocopic pains of a splitting, boring, bone-breaking character, coming on worse at night, with great regularity and terrible fierceness, and ceasing toward morning. The warmth of the bed aggravates them, and sometimes the weight of the bed-clothes is intolerable, produced by a febrile exacerbation coming on toward evening which dilates the peripheral blood vessels.

Sphilitic Node.—This is an inflammatory periostitis, generally terminating in the new formation of bone. The sub periosteal tissues become congested and soft, round, and spindle cells are formed, which proliferate and increase till they separate the periosteum from the bone, giving rise to an oval lump or tumor which shades off into the surrounding tissues, and which may remain for years. The bones most involved are the superficial flat bones. The node, after remaining soft for a considerable

time, becomes firmer, and either disappears under treatment by absorption, or disintegrates leaving behind an ulcer, the floor of which is bone denuded of its periosteum. The bone becomes dark-colored from exposure; in a while it separates, comes away, after which the ulcer heals.

Alopecia frequently occurs as one of the conditions of the syphilitic contagion. The roots of the hair are principally involved; large quantities of scales or scurfs form about them and destroy the capillary radices; the hair as a consequence falls out leaving in some instances the scalp perfectly bare. The eyebrows are also affected in the same way, and the hair of the breast and limbs sometimes becomes involved. Tertiary syphilitic lesions so called, whether the effect of mercury or contagion, are seldom seen at present, and I believe are more frequently the result of poisonous doses of the drug, than the sequelæ of the syphilitic virus. A careful investigation will show that the ravages of syphilis as described in the works of allopathic syphilographists, two or three decades ago, as compared with those of the present day, hold an inverse ratio to the poisonous quantities of mercury given in its treatment. Treatment, see special indications, page 99.

Onychia Syphilitica consists of inflammation of the matrix of the nail, and consequent loss or disfigurement of the nail itself, and is an occasional attendant upon both secondary and tertiary syphilis. Its further consideration will be referred to the treatment of constitutional syphilis.

Syphilitic Iritis.—The primary seat of the disease is in the iris, but other tissues of the eye may be implicated. Generally but one eye is involved, which presents most of the symptoms of common iritis. At the beginning of the disease, says Helmuth, the iris becomes duller, with a grayish appearance, the radii being more or less effaced; the small circle of this membrane is livid or copper-colored; its tissue tumefies and forms an elevated ring composed of thick downy flakes. The pupil is more or less contracted, and assumes an irregular shape; the cornea is somewhat dimmed, and on its inner surface may be seen small fasciculi of congested vessels; the tunica albuginea is of a rose color, which at its juncture with the cornea is converted into a dark-red hue,

called the *dyscrasia circle.* As the disease advances the iris becomes more discolored, its surface is covered with exudation, its free margin is tumefied and upon its anterior surface there are elevations of a grayish or yellow tinge. The pupil at length becomes perfectly immovable; pedunculated excrescences called *condylomata of the iris,* spring from the membrane, and adhesion takes place between the iris and the lenticular capsule. At the bottom of the anterior chamber, pus mixed with blood can be seen. There is at this time violent constrictive boring pains in the supra-orbital region of the affected side which radiate towards the head; they are *increased towards evening, most violent at midnight, and abate towards morning,* the peculiar characteristics of syphilitic pains. Sight is more or less effected by reason of the plastic exudations formed in the pupillary opening. Photophobia is rarely present in this disease.

Treatment.—The object of the surgeon in the treatment of this formidable disease is to allay inflammatory action, eliminate the syphilitic poison, and to arrest further extension of the inflammatory process. To accomplish this the pupil must be artificially dilated; this can be accomplished by dropping into the eye, three or four times a day, a few drops of a solution of *Atropine.** This dilates the pupil and rests the inflamed muscular fibres.

Rhus tox. is useful in the primary stage accompanied with profuse lachrymation.

Petroleum should be given when there is redness in the eyes, with pain, heat and throbbing in the occiput.

Cinnabar, when pain affects the supra-orbital region; when *abscess* forms in the iris, *Hepar., Merc. Sol.* and *Sulph.*

Chancrous ulceration when it it attacks the corona, *Ars.,* and *Calc.,* are remedies of value.

Mercurial toxæmia is benefited by *Nit. ac., Hepar., Mez., Dulc., Kali chlor.* When there is an exudation of lymph, or the inflammation is of a sub-acute character, *Apis.* and *Colch.* will be found reliable.

Syphilitic ulceration of the larynx is caused by an extension of the ulceration of the palate. It is characterized by tenderness, great huskiness of voice, suffocating cough and expectoration of

* Atropine, grs. iv; distilled water, 1 oz.

sticky, tenacious mucus or bloody matter. There is slight difficulty in swallowing at times, the voice degenerates into a mere whisper and is accompanied with great loss of flesh, etc. Strength and life is often terminated by it.

Treatment.—The medicines which have produced most marked benefits are the *Kali bichrom.*, *Kali jod.*, and *Merc. cor.* Prof. Helmuth has derived much benefit from *Ars.*, *Iod.*, *Macrot.*, and *Podoph.* A weak solution of *Iodine* thrown into the throat by means of an atomizer is recommended as highly efficacious. Prof. H. uses the solution of *Iodine* of the following strength: ten drops of the first decimal dilution in a gill of water, and applied twice a week. A solution of *Merc. cor.* applied locally by means of a camel's hair pencil, is very beneficial.

PART II.

MORBID GROWTHS OR TUMORS.

CHAPTER I.

GENERAL CHARACTERISTICS OF TUMORS.

Tumors, from tumeo, (to swell) is an indefinite term, but is applied to any preter-natural eminence developed in any part of the body. Gross defines it as an "enlargement of a part, structure, or organ, produced by abnormal deposit," either different in character from the healthy tissues or else excessive in its growth. A *carcinoma* differs from every other tissue in the body (neoplasm). A *fatty tumor* is merely excessive growth (homoplasm) They are divided into two great varieties, the *benign* or innocent, and *malignant* or cancerous, with a hybrid class called the *semi-malignant*, not yet thoroughly understood.

Pathology.—Diversity of opinion; late authorities contend that they are due to transformation of tissues; increase or multiplication by division of cells having a previous existence in the part abnormally enlarged. Others assert that these growths result from causes acting through the blood itself; a morbid product is

exuded originating nucleated cells, developing tumors by transformation of the various structures

Origin.—The microscope has indeed furnished accuracy of detail in the appearances that have been presented in the slight and almost imperceptible visual changes seen in the varying stages of the same pathological process; yet it has unquestionably confused the divisions and sub-divisions of these neoplasms, and left us in an interminable doubt and confusion of nomenclature.

As a means of diagnosis (before operation) between innocent and malignant tumors, the microscope has been of little practical benefit. *After* removal it is true their characteristics and histological elements have been more clearly defined. How much more benefit would this instrument confer upon humanity if the opposite condition was true.

All benign tumors result from some derangement in the functions of the *primitive* tissues, occasionally perhaps by some local irritation. Dunglison attributes this growth to some morbific cause operating in certain parts of the body. Schuppel's theory of "giant cells" created a new sensation. Lostoffer's "corpuscles" produced consternation among the syphilographs, and the typical "cancer cell" has opened up a new field of controversy, so that the origin and growth of tumors are in the same state of confusion and perplexity as is that of inflammation at present. The question of *malignancy* is not to be determined histologically, but rather by observation and clinical study. The greatest malignancy and the most positive benignity may be united in the same group. Billroth avers that "two sarcomata of the most similar histological qualities may differ entirely in their course." Holmes divides all tumors into Homologous and Heterologous varieties. The *homologous* are those in which the substance of the tumor has an exact anatomical resemblance to some tissue of the body (benign). The *heterologous*, in which the morbid growth does not present any resemblance to the normal tissues (malignant). The benign as a rule are unattached to the tissues. The malignant glue together and absorb all the natural structures, changing their physical, chemical and vital properties.

The genius of tumors therefore includes, 1st. That they are

composed of a living tissue, either natural or unnatural, and if natural tissue, yet developed in unnatural quantity. 2d. That they guow independently, or in Mr. Paget's words: "They grow wity appearance of adherent power, irrespective of the growing or maintainance of the rest of the body, discordant from its normal type and with no seeming purpose. Again, while forming part of the body and borrowing from it the apparatus and materials necessary to its life, the tumor grows, or maintains itself, or degenerates according to peculiar laws."

Sir James Paget's* views closely resemble the opinions laid down by Holmes. Virchow's arrangement of tumors which is undoubtedly the most scientific from the microscopic standpoint, is nevertheless most perplexing and confusing to the mind of the student. There is no question, that in a scientific point of view, the nomenclature of tumors should have reference to their anatomical structure; but this has been found impracticable on account of the varying and multitudinous appearances presented by microscopic study and observation. Billroth doubts the expediency of this classification, and yet he adds, "it is my endeavor not only to gain for pathological histology an independent position and a purely anatomical ground, but also to reinstall surgery, in regard to the diagnosis of tumors, in its full rights, which it had for a time too willingly given up." Muller declares, "that the microscopical and chemical analysis, shall never become the means of clinical diagnosis," While German authors strenuously cling to the system reluctantly adopted by Billroth, the English and American writers continue largely to adhere to the clinical classification. Says Helmuth, "therefore, on account of the uncertainties at present realized, and those which, no doubt, are yet to come, and in view of the great variety of terms here and there introduced by the histologian, we shall attempt to classify tumors in accordance with their clinical characteristics, and to describe their structures histologically, and may hope for a future when the many discrepencies which now overshadow the magnificent classification of Virchow and Billroth, will be removed and a more simple arrangement of these growths, at least for the student and practical surgeon, be arrived at." With the

* Lectures on Surgical Pathology.

views heretofore expressed, I yield a hearty concurrence, and the classification which I shall adopt is that with reference to the nature of the growth and its development: First, the nearer a tumor in its homological characters, coincides with the "perfectly developed" formations of the human system, the nearer it approches the innocent type; on the other hand, the nearer a tumor concides with abnormal, embryonic or imperfectly formed structure, the more certain it is to belong to the malignant or semi-malignant variety. The *benign* or *innocent* tumors are assumed to originate in a sort of "error loci" of formation and are homologous or homœomorphus, corresponding with the normal tissues of the body. They are perfectly compatible with a good state of health. They are harmless in their effect upon neighboring tissues. They have an uncertain period of increase, are generally round for a time, may either remain stationary or undergo a process of fatty or earthy degeneration. In their anatomical structures they resemble the normal tissues of the body, are unattended, as a rule, by any marked constitutional disturbance, and when effectually removed, there is no return, either in the same or in any other place. The only exception to this rule being the recurring fibroids.

The *malignant* type of tumor, on the contrary, possesses the following diagnostic marks. They are of constitutional origin; their progress is generally rapid, constant and painful. They are disposed first, to soften, then ulcerate, with a tendency to rapid or slow infiltration and destruction of the surrounding matrix. They enlarge irregularly, assuming a lobulated shape with offshoots extending into the deeper structures. They give off a peculiar fetor, accompanied with persistent and sometimes fatal hemorrhage. They infiltrate every tissue in their vicinity, are liable to secondary deposits from being absorbed in one part and deposited in another, and they are prone to return after extirpation.

The *semi-malignant* tumors or intermediate class, "include those which possess some, but not all of the vital characteristics of the cancerous growths: as well as those which like the fibre

plastic, resemble cancer in their coarse appearances, though not in real structure; some varieties of fibrous fibro-plastic tumors and cartilaginous tumors, says Druitt, may not only return if removed, but may invade many external organs. Paget describes varieties of this kind of tumors, which not only returned after extirpation, but caused ulceration and sloughing, involving neighboring structures and finally terminated in death.

Tumors occur in every part of the body; as a rule the *benign* growths affect the skin, cellulo-adipose structures, nose, ovary and uterus, while the malignant attack most frequently the glandular organs.

Tumors vary in *form*, *color*, *volume*, *consistence*, and *mobility*. In form they assume almost every shape, are smooth, uneven, round, lobular, conical, and spheroidal. Those that involve the lymphatics are generally uneven and nodular; the fatty and encysted are usually smooth and spheroidal. In color, they vary in accordance with the number of vessels and inflammatory action in the growth; thus, the fatty tumors are yellowish; fibrous are whitish; the naevi are purple, and the cartilaginous are white and glistening. In volume, they range from a millet seed to a bulk equal to the weight of the patient's body. In consistence they are soft, hard, or semi-solid; the scirrhus and fibroid are hard and stony; the cystic are soft and the fatty tumor has a semi-solid "feel" midway between the cystic and fibroid. The mobility of a tumor depends both on its character and its situation in the body. The fatty tumors are freely movable; the exostosis are immovable, hard and firm; and as a general rule, the benign growths are movable upon the tissues, while the malignant are firm, inelastic and immovable.

Situation.—Every part of the body is subject to these growths. The *malignant* attacks glands, connective tissue, the ends of long bones, and the viscera. The *benign* affects the skin, cellular and adipose tissues, the nose, uterus, ovaries, the liver, testicle and bones. They vary in size from a pin's head to the largest dimensions.

GENERAL DIFFERENTIATION.

RELATION TO SURROUNDING STRUCTURES.

BENIGN TUMORS.	MALIGNANT TUMORS.
Have neither hereditary nor constitutional dyscrasia.	Have both hereditary and constitutionl predisposition.
Are not closely connected to the adjacent structures.	Are infiltrated into and embody the surrounding structures in their own substance.
Tumors grow slowly as a rule.	Tumors grow rapidly when fully developed.
Are frequently multiple; advance equally, and affect the *same type* of tissue.	Are solitary and only muliply by infection, and affect different types of tissue and localities.
No tendency to ulceration.	Marked tendency to ulceration.
Tumors are stationary for some time, when developed they grow slowly.	Grow fast when fully developed, and extend in all directions.
Rarely accompanied by offensive discharges.	Very offensive, ichorous or bloody discharges.
The structures adjoining are either healthy or indurated by the inflammatory process.	The structures adjoining are changed from their normal condition and are infiltrated.
Absence of hemorrhage.	Liable to profuse bleeding.
The ulcer heals readily when irritation ceases, or if ulceration is extensive the tumor may be destroyed.	The ulcer has no tendency to heal and no reparative process is manifest; the disease increases with the ulceration.
The growth is homologous and homorphous, and like other natural tissues of the body.	The growth is heterologous and heteromorphous and entirely differ from natural tissues.
No constitutional effects whatever are developed in any of its stages; when reproduced, is in kind.	The constitution shows evidence of contamination in advanced stages; scirrhus grows slowly; is hard; skin puckered and ulceration, and hemorrhage late; is seldom reproduced in variety, but always in kind.

Classification of these tumors differ. Some authors arrange them *histologically* from their intimate and minute anatomical structure; others *clinically* from history and terminations. American pathologists adhere generally to the latter. I shall adhere to the classification of Mr. Bennett, of Edinburgh, who based his arrangement on the compound textnre of tumors, aided by their resemblance to pathological conditions. There are three grand divisions: *Benign, malignant,* and *semi-malignant,* or recurrent tumors.

The Varieties are thus tabulated: *Cystoma, Adenoma, Lipoma, Angionoma, Osteoma, Enchondroma, Fibroma, Epithelioma,* and *Carcinoma.*

They are also sub-divided according to their sensible properties, as, *Hygroma*(watery), *Melanoma*(black), *Chloroma*(green).

Hæmatoma (bloody), *Colloma* (glue), *Steatoma* (lard), *Atheroma* (gruel), *Meliceroma* (honey), *Cholesteatoma* (cholesterin), *Sarcoma* (flesh), *Neuroma* (nerve), *Encephaloma* (brain), *Myeloma* (marrow), *Sherrhoma* (marble).

Cystoma is a simple tumor, and consists of a capsule of condensed areolar tissue, containing different kinds of fluid or semi-fluid matter. The accumulation of secretion within a sac or cyst is gradual, with dilatation and hypertrophy of its walls. There are *three* vorieties. 1st. Encysted tumors of skin, mucous membrane, and sub-cellular tissue, produced by closure of the mucous follicles or obstruction of the excretory ducts, viz: atheromatous tumors. 2d. Those formed by closure and dilatation of the ducts of excretory glands or organs, as *ranula*, and cystic tumors of the breast from occlusion of the lacteal ducts. 3d. By retention or modification of the secretion in cysts without excretory ducts as the synovial bursæ. Paget divides them into *simple* or *barren*, *compound* or *proliferous*, with occlusion of natural ducts. Holmes, in his system of surgery, adopts very nearly the classification of Paget, viz.:

1st. The *simple* or barren cysts; the serous and hygromas; synovial mucous; sanguineous; oily; colloid and seminal.

2d. The *compound* or proliferous; complex cystoid, with intercystic growths; cutaneous or dentigerous.

Billroth sub-divides them according to the contents of the sac, thus, cysts with *serous* fluid, cysts with *mucous* contents. and cysts with a *pultaceous* or fatty matter. In the latter variety are contained pieces of bone, teeth, hair and such like materials. They are found in the ovary.

Cystomas are single or multiple; of irregular growth; are distinguished from abscess by their history, slow growth, elasticity, mobility, their smooth oval character, absence of pain, movable-

ness, healthy integument. They are met with about the face, scalp and other parts, and vary from the size of a pea to that of an orange.

Hydatids are another form of this tumor, so are polypoid tumors, and the acephalocyst, which are found in the liver, ovary, uterus, and are supposed to be the product of a parasite which is found within the cyst.

Treatment.—The remedies frequently curative of this condition are: *Apis.*, *Ars.*, *Arn.*, *Calc.*, *Graph.*, *Kali bi.*, *Lach.*, *Rhus.*, *Phos.*, *Lyc.*, *Merc.*, *Sil.*, *Staph.*, *Sepia.*, *Sulph.*, and *Teucrium;* the appropriate remedy to be selected according to its pathogenesis. The surgical means are: *Extirpation*, *Electrolysis*, *Sub-cutaneous puncture*, *Evacuation*, *Injection* and the *seton.* See special indications at the end of this chapter.

Cystis Synovalis, Hygromata, or Bursal tumors. This includes enlargements of both the natural and accidental bursæ in various parts of the body, and from the frequency with which they occur, and their liability to be confounded with other tumors, makes it necessary to give some anatomical outlines in reference to their position in the system. Superficial bursæ are sometimes seen upon the symphysis of the lower jaw, also *under* the angle of the jaw. "I have met with, says Hamilton, a bursal tumor formed within the synovial sheath which covers the tendon of the digastricus. A natural bursa exists in the thryo-hyoid ligament and an accidental one may form in front of the thyroid cartilage. An accidental bursa has been seen over the acromial process. A natural bursa exists between the acromion process and coraco-acromonial ligament on the one hand, and the capsule of the shoulder joint—small and sometimes wanting; between the under surface of the sub-scapularis and the neck of the scapula, gradually communicating with the joint; between the same tendon and the capsule, small and frequently communicating with the joint; between the conjoined tendon of the coraco-brachialis and short head of the biceps near its origin and the capsule of the joint, not always present; within the sheath of the long head of the biceps, between the tendon of the teres major and the upper margin of the tendon of the latissimus dorsi and the humerus; between the tendon of the latissimus dorsi and the

humerus—small. The bursa between the tendon of the lat. dorsi and the inferior angle of the scapula is quite often found enlarged by increased synovial secretion. Velpeau speaks of this bursa as the frequent seat of hæmatic tumors. There is a bursa between the tendinous insertion of the biceps and tubercle of the radius; one also between the olecranon process and the triceps; and one *over* the olecranon process called the miner's elbow. The various bursal sacs in the neighborhood of the wrists are often productive of disease and enlargment. They are sometimes met with over the sternum in cabinet makers as the result of pressure by instruments. They are also numerous in the region of the hip joint; over the tuberosity of the ischium, over the ant. sup. spinous process of the ilium, and also upon the coccyx; beneath the gluteus maximus and the femur; between the gluteus medius and the great trochanter; between the obturator externus and ischium; between the obturator internus, gemini and scapular ligament; beneath the conjoined origin of the semi-tendinosus and the long head of the biceps, and beneath the origin of the semi-membranosus; between the conjoined tendons of the psoas magnus and ilicus internus and the capsule of the hip joint; in the lower portion of the thigh, under the expanded tendon of the quadriceps; over the trochanter major; under the quadriceps; between the biceps flexor femoris and the head of the fibula; under the popliteus; over the patella; under the ligamentum patellæ; over the tubercle of the tibia and over either condyle of the femur; between the tendo achillis and the os calcis and under the os calcis." All these bursæ are liable to disease and subsequent enlargement, and were they not thus anatomically described, might be mistaken for other and more serious disorders.

Treatment.—The medical treatment consists in the use of *Arnica* when the trouble arises from bruises or injuries.

Aconitum.—Much *febrile* disturbance.

Belladonna.—Considerable heat, *redness and swelling* of the part, with *lancinating pains.*

Rhus.—Pain worse when sitting, and when *warm* in bed.

Ledum.—Pain, etc., with *chilliness.*

Iodium.—Chronic Bursitis in persons subject to *glandular enlargements.*

Kali Hyd.—With *rheumatic* complications. *Graph.* (chronic cases with redness); *Agar.* (itching); *Hep. s.*, or *Sil.* (tendency to suppuration); *Bry.* shooting pains. A lotion of *Acon.*, *Bell.*, *Bry.*, *Led. pal.*, *Rhus*, *Iod.*, *Agar.*, or *Arn.*, should be used when the same remedy is being administered internally.

Sticta pul., introduced to the profession by Dr. Price, of Baltimore, is said to have produced most excellent results. Dr. Hasbrouck, of Brooklyn, endorses its sphere of action, and highly recommends its use in bursal affections. Dr. Price testifies to its efficiency in twenty-five cases of acute bursitis. He employs the first dec. dilution in water every two hours and remarks that in *chronic bursitis* he has never found any beneficial action from its use. I can testify to the curative action of *Kali hyd.*, in almost every case I have used it in this painful affection, whether in acute or the chronic variety. I employ this remedy in solution. 5 or 10 grains in ½ glass of water, and give one tablespoonful four or five times a day.

Surgical Treatment.—If the above remedies are unsuccessful, a stout thread of silk should be passed through the centre of the tumor, the effect of which, in a few days, is to convert the bursa into an abscess, which, when mature, should be opened. The thread should be removed from the wound after the exudation of pus from the orifices made by the needle. Aspiration may be successfully employed in certain cases, and the contained fluid drawn out. Opening the bursa with the knife, and painting the inside with *Iodium*, is a more satisfactory operation. When the tumor is solid, excision is the most effectual method, and one accompanied with little risk.

Ganglias.—Weeping sinews. This is a variety of bursa which consists of a serous or synovial capsule, usually of small size, and situated between the layers of a sheath enclosing a tendon, and sometimes communicating by a small orifice with the interior of the tendinous sheath. Its most frequent seat is upon the back or front of the wrist, or upon the top of the foot, and are supposed to originate from sprains. They are generally small, oval or round, firm but elastic, colorless growths, varying in size from a pea to a pullet's egg, and are observed to move with the tendon to which they are attached. Their contents are usually of a

light-colored, glairy fluid, resembling the white of an egg, with rather more consistence than is usually found in other synovial or bursal sacs.

Treatment.—These bursæ sometimes disappear spontaneously, but are disposed to return sooner or later. Firm and continuous pressure will often effect a cure; in other cases a more speedy dispersion of the swelling may be effected by a sub-cutaneous incision of the sac, and pressure applied afterwards to prevent the refilling of the capsule. The method generally preferred is, to have the patient bend the wrist, in order to contract the tissues, and rupture the sac by a smart blow made by the back of a book or a flat ruler, after which they seldom recur. Free incisions and injections thrown into the sac have been recommended by some surgeons, but I think the simple processes are better, as they are not apt to be followed by violent inflammation and suppuration, a result to be dreaded by the operator. See special indications at the end of the chapter.

Proliferous Cysts are those which are capable either of multiplying themselves, or of generating new growths. "Those cysts which ocupy venous or arterial radicals, or those which have their seat in a large number of Graafian vesicles are termed barren, because they have no capacity of either reproduction or self-multiplication. Proliferous cysts in their origin and early history, may differ in no appreciable degree from barren cysts, nor is it possible to determine upon what condition of the germ or cell structure the new genesis depends; it may develop from the inner or outer wall of the original cyst, or between its laminæ, and may be then classed according to location, endogenous, exogenous or intra-parietal. In form and intimate structure they present several varieties; some are analogous to, or exact counterparts of the original cyst. Thus, in the ovarian cyst, "the endogenous or intra-parietal growths, may resemble in form, structure and contents the parent cyst; in other cases they exist as clusters of small, thin-walled, pedunculated vesicles. The neoplasms may be cystic, vascular, or papilliform, gelatinous, colloid, fibrous or cartilaginous, osseous or cretaceous. In short, they may assume the widest range of histological and of clinical

ch aracter.They are at one time benign, again recurrent, and finally malignant."—*Hamilton.*

In the proliferous variety of ovarian cysts, there are two kinds of endogenous cystic growths; the *spheroidal* have broad bases, and are in structure similar to the parent cysts; while the *slender* have thin walls, are attached by pedicles and occur in clusters. Intermediary and mixed forms also occur, in which the characteristics of each class are present to a greater or less degree.

Cysto-Sarcoma, a variety of the compound or proliferous cyst, is a peculiar growth developed in different or heterologous structures and occurs more frequently in females than males. It has been the subject of much controversy among pathologists and various opinions have been expressed as to its nature and characteristics. It invades by preference the mammary gland, but is sometimes seen in bone, within the medullary canal and in the compact structure of bone. Johannes Muller has included in the growths *three* subdivisions only, although Paget, Brodie, Hawkins and others, have made many more, which only confuse the mind of the student, without producing any corresponding benefit. First, the *cysto-sarcoma simplex* of Muller, is that variety "in which the cradle mass does not intrude at all into the cavity of the cyst and is of the rarest occurence. Second, the *cysto-sarcoma proliferum* is engendered by the development, within the terminal excrescence bulbs of the acinus-like cavities, into filial cysts, and the intergrowing of the cradle mass is here repeated." Third, "the *cysto-sarcoma phyllodes* with its amply developed warty cauliflower and foliated or cock's-comb-like ingrowths, has nothing to mark it beyond the size and development of the excresences." The cyst membrane is here no longer demonstrable, having coalesced with the cradled mass of the cyst." "It has been stated that the dendritic intrusions into the cyst may occur at one point only of the cyst, at several points, or lastly at all points simultaneously. In the last case they converge, coalesce, and eventually fill the entire cyst, determining thus its aggregate lobular structure."

A very interesting case of cysto-sarcoma, of twenty years' duration, in a lady of sixty-eight years of age, and of enormous growth, is mentioned by Prof. Helmuth, one of the interesting

points of which is, that after visiting the medical savans of Europe, and undergoing treatment from many distinguished physicians and surgeons in this country, without any decided relief, he gave internally *Kali brom.*, with most marked benefit. the enormous growth crumbling away in masses under the use of the remedy. He began the treatment with two grains, three times daily for two weeks, and gradually lessening the dose, "the tumor shrunk perceptibly;" after several months she finally succumbed.

Cysts in Bone.—This variety of cysts is found in the osseous system, in the diploe and cancellated structure. They attain a considerable size, and are found most frequently in the upper or lower jaw, or in the lower end of the femur.

Sanguinious Cysts are closely allied to the serous, and by Bennett and other writers are designated as "hæmatoma." Paget describes them as originating in three different ways, "either by hemorrhage into a previously existing serous cyst, by partial obliteration and transformation of a nævus, or by the occlusion and dilatation of a vein." They are found most frequently in the neck, and contain a bloody fluid. The cyst wall varies in thickness and density according to locality. It is membranous in sub-cutaneous cysts, the membrane presenting a columnar or fasciculated appearance, due to its unequal rupture. Helmuth mentions a *Thyroid cyst*, in an infant, directly over the thyroid cartilage and fluctuating, which he cured "by pulling it forward and passing beneath it small needles crossed at right angles and strangulating the mass with waxed silk passed behind them.

Congenital Cutaneous Cysts are sometimes seen upon the foreheads of infants soon after birth. They are round, oval or flat, and contain an oily fluid; the cyst wall is composed of "membranous connective tissue, lined with tessellated epithelium."

Mucous Cysts comprise all cysts originating in mucous tissue; they generally occur in females, are developed in the sexual organs, usually grow singly, sometimes multiple, and are generally oval in shape. The cyst wall varies in thickness and density, sometimes it is thin and membranous; at others it is thick and inelastic; the contents of the sac also varies, often it is an

almost transparent color, while at other times it assumes a dark, turbid appearance, nearly resembling ink in color. Mr. Hawkins relates a case of the kind wherein the contents resembled liquid fæces.

Colloid Cysts are thus named from the contents of the sac, which resemble gelatine or glue; these are of various colors, ranging from yellow to almost black, and of different consistencies "between pellucidity and thickest turbidness." They are often found in the thyroid gland, in the ovaries and prostate. A colloid or gelatiniform bearing cyst is occasionally found in many hypertrophic tumors, and especially in the mammary gland.

Treatment.—The treatment of cystic tumors has been quite successful by the practitioners of the homœopathic school. Prof. Helmuth has obtained much benefit from the internal use of *Kali brom.*, given in two-grain doses three times a day. Prof. Dunbar recommends *Calc. carb.* for encysted tumors of the head and neck, with fluid contents. I have seen marked benefit from the internal use of *Baryta carb.*, *Kali hyd.*, and *Silicea* in these tumors. Dr. Ruddock extols the use of *Baryta*, *Sil.*, *Kali hyd.*, *Lyc.* and *Sulph.* Dr. Gilchrist strongly recommends *Apis.*, *Arn.*, *Bell.*, *Col.*, *Graph.*, *Plat.*, *Rhod.*, *Rhus*, *Sepia.*, *Sil.* and *Sulph.* as productive of excellent results.

Among the surgical means may be recommended, *electrolysis*, the *seton*, *injections* for the purpose of producing adhesion, *enucleation*, followed by an enucleating paste composed of equal parts of *Hydrastis* root, *Chloride of zinc*, flour and water, and *complete extirpation*, which is of all measures the most prompt, reliable and successful.

Adenoma, or hypertrophy of gland structure, is commonly associated with change of texture; the gland enlarges, usually without pain and presents a tumor circumscribed, smooth, or lobulated in its outline; *movable, firm*, often elastic to the touch, and incased in a distinct capsule; occasionally it is callous, at other times there is considerable tenderness on pressure. They occur in different parts of the body; the part in which they grow determines their name, as labial, mammary, etc.; they vary in size, and are often attributed to chronic inflammation. By interfering with the action of adjacent organs or parts they frequently cause great

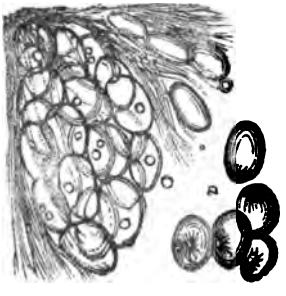
inconvenience. *A faulty condition of the system* usually accompanies these growths; they are most frequent in adult life.

Histological elements—The histological elements are, true glandular structure, with fibrous septa, concrete in shape, lobular in form, with glandular epithelium in each lobe. When occurring in the breast; they are affected by the menstrual period. At times they are associated with malignant neoplasms. The septa are concentric in form and are composed of fibrous tissue, and sometimes they radiate from the center to the circumference.

Treatment.—The remedies that are appropriate to the cure of these growths are *Arn.*, *Ars.* *Aur.*, *Bell.*, *Bry.*, *Brom.*, *Baryta*, *Carb. an.*, *Calc. carb. et. jod.*, *Con.*, *Graph.*, *Lyc.*, *Iod.*, *Lap. alb.*, *Merc. jod.*, *Phos.*, *Plat.*, *Phy.*, *Rhus*, *Puls.*, *Sil.*, *Zinc.*, and *Sulph.*

The *surgical* means are excision, removing the capsule and enucleating the tumor, compression, enucleation, electrolysis, and local applications of *Iodine*, ligature or the caustic.

Lipoma is identical in structure with healthy adipose tissue, is composed of fat cells in loose connective structure, is generally found in those situations of the body where fat naturally abounds, as in the back of the neck, the shoulders or the buttocks and occasionally within the cavities of the body. They are



encysted or diffused, and sometimes possess a migratory character. Histological elemets: a mass of fat enclosed in a fine, thin capsule. The capsule gives off septa, which dip into the mass and separate the growth into lobules; through this capsule it receives its supply of blood; they have loose attach ments, are irregular in form, lobulated, soft and doughy to the touch; of low vascularity; painless, except from nervous pressure; grow slowly, and often attain a large size. Terminations are adhesion, inflammation, degeneration and absorption. I removed a degenerate Lipoma from a female, weighing over five pounds, from the lower side of the abdomen, before the class of 1881, in the homœopathic clinic, U. of M.* At St. Louis I took out one weighing over 11 pounds.

* It is preserved in the "Eckel Museum" of the homœopathic college.

Treatment.—The remedies capable of effecting the best results are: *Bary.*, *Calc. c.*, *Bap.*, *Bov.*, *Caust.*, *Kali jod.*, *Phy.*, *Still. Sil.*, and *Sulph.* Local applications of *Arn.* tinct. are often curative in the early stages. The surgical processes are excision of the entire mass with its capsule.

Angionoma is composed of a net-work of small blood-vessels connected by areolar tissue. There are three varieties, viz.: *Capillary, venous* and *arterial.* In the first the tumor consists of an enlargement of both arterial and venous capillaries; in the second of venous branches alone, and in the third of arterial twigs. They are of various sizes and colors from a deep rose to a purple and occur congenitally or soon after birth. Their favorite seat is on the face, lips, and mucous membranes. When they appear on the skin, are called *nævi materni;* are compressible, elastic and can be partially evacuated by pressure, do not pulsate and have no bruit; when they are large and composed chiefly of arteries they are termed *arterial nævi*, and are a variety of *aneurism by anastamoses*; they are elevated in form, of a bright red color, and pulsating. When of considerable size they feel when grasped by the fingers, like a wet sponge. At first the stroma of the nævi materni is the connective tissue, which soon assumes a kind of cellulo-fibrous appearance, having honey-comb spaces communicating with each other; the cells being bounded by convolutionsof the vessels; finally all intervening tissues are absorbed and the tumor is composed of the blood-vessels alone with their convolutions. Their boundaries are not prominently defined except when they are invested by a thin capsule.

Treatment.—The remedies which have produced the most beneficial results in the treatment of these affections are: *Acet. ac.*, *Ars.*, *Borax.*, *Ham.*, *Iod.*, *Lyc.*, *Sec.*, *Sil.*, *Sepia.*, *Sulph.* and *Thuja.* The surgical means which up to the present time have been most relied upon are: Excision, ligature, and the galvano cautery. Injections of *Per. Sulph.*, *Ferri.*, *Sec.*, *Ham.*, *Carbol.* and *Acet. acids*; heated needles through the base, vaccination and fuming *Nitric acid* externally. If they are situated upon or in close apposition with important blood-vessels, or incorporated with prominent nerve trunks, the operation becomes correspondingly hazardous. If they are incapsulated, the hemorrhage during removal is

slight. These nævi are often gotten rid of by pressure produced by collodion plaster, by cauterization with red-hot needles run through the base of the tumor, or by vaccination. *Nit. ac.* has been used to produce sloughing and consequent disappearance of the growth. Prof. Helmuth has employed with success, injections of the fluid *Extract of Ergot* into the tumor, repeating the process after a lapse of eight days. He uses from 40 to 60 drops of the fluid extract, even in those cases where there is considerable pulsation. The injection of the *Per Sulph. of Iron* has been followed by death and on that account is not considered safe.

Capillary Hypertrophy.—Ectasis is the most frequent form of these vascular growths, and is the variety to which the name of "mother's mark" is most appropriately applied. They are usually congenital, occur upon the face and neck, and are composed almost entirely of dilated and tortuous capillaries, involving the cutis alone, with little or no elevation above the skin. They are of a bright red color, and vary in size from a mustard seed to several inches in extent and sometimes disappear spontaneously. They grow slowly and after the lapse of many years attain considerable proportions; occasionally they are associated with the *venous* capillaries, when the surface becomes elevated and the color assumes a variegated or mottled blue and red appearance.

Treatment, when desirable is often successfully met by the internal and external use of *Thuja*. *Calc. c.* has also been employed with good results. Dr. Hemple advised the external use of *Kreasote*, one drop of the tincture to eighty drops of water, applied two or three times a day;—the effects being excoriation, ulceration and cicatrization, with scarcely any disfigurement remaining. *Croton oil* is said to be equally efficacious.

The surgical treatment is the seton, thread, ecraseur, red hot needles, etc., etc., as recommended for venous nævi. Mr. Skey recommends, that when the nævus is large, "threads should be passed across the growth in various directions and not necessarily through its centre, but occupying its substance in all directions." A large nævus may require eight or ten threads. The object is to procure suppuration, which as soon as established, demands the removal of the threads. To this should be added a little pressure if it can be conveniently applied. Dr. Maas, of Breslau,

has collected the histories of 112 cases treated by the galvano-cautery, with the following results. *Capillary* nævus, cured, 32; improved, 1; result unknown, 1. *Venous* nævi, cured, 72; improved, 1; result unknown, 1: died. 3. *Arterial* nævi, cured, 2; improved, 1. Nævi combined with other tumors, cured, 6; improved, 1: result unknown, 2.

Moles.—These peculiar growths of imperfectly-organized skin with colored matter in its interstices, exhibit a likeness to that capillary and plexiform vascularity that belongs to the true angioma. They occur upon different parts of the body, and like warts and angioma, possess that kind of ectasy of structure which in advanced life from rude manipulation may become the seat of malignant growths. For this reason they should be ex tirpated whenever they seem inclined to spread and become irritable, before they assume the nidus of epithelioma or cancer. Throughout this condition the health of the person should be carefully watched and prompt treatment employed whenever the least disposition is observed that looks towards degeneration of structure.

Osteoma.—The tumors of bone like those of the soft structures are divided into the *innocent* and *malignant*. They occupy the periosteal or external surface of bone, the medullary membrane or cancellated structure. True bony tumors are not so common as those containing bone elements as part of their constituents, which are seen in various portions of the body.

Exostoses are those tumors which are attached to bones and are divided into three varieties: the *spongy*, *hard*, and *eburnated*.

Spongy exostoses are those which take place in the epipheses of long bones, enclosed with a thin layer of epiphyseal cartilage. Virchow calls them the ecchondrosis ossificans; they are smooth, hard, globular, and nodulated or have spinous projections; grow slowly; are painless and produce no discoloration of skin; the tibia, fibula and humerus are their most frequent seat and can only occur before complete ossification of the epipheseal cartilages.

Hard exostoses resemble the lamellated tissue of natural bone; are more often spinous in form, and occur usually at points of muscular attachments; they are hypertrophies of natural spines

and processes, and take place on parts of the skeleton subject to pressure and attrition; they affect the long bones.

Eburnated growths are unfrequent. They grow from the inner or outer surface of the cranial vault, sometimes springing from the diploic structure, or in the frontal sinuses, orbital plates and antrum. Paget calls attention to a variety emerging from the last palanx of the great toe. They are rarely one-half an inch in diameter on the outer plate of the cranium; in other parts they assume larger proportions, but are developed on flat bones.

Microscopical observations show ivory-like exostoses exhibiting Haversian canals, lacunæ and lamellar structures more compact than bone, and possess less animal matter and carbonates, and more phosphates than normal bone; cause is a hyper-nutrition of bone tissue; exostosis when occurring near joints frequently bridge over articulations and produce anchylosis. They not only interfere with functions of adjacent parts, but may become dangerous to life. Upon the internal surface of the innominata they may afford a dangerous obstacle to labor; within the cranium or vertebræ they may occasion fatal pressure on the brain or spinal cord. They are of slow growth and in the early stages produce little trouble, but as growth increases the symptoms are correspondingly severe; severe neuralgic pains, abscess, epilepsy and paralysis may follow in their train.

Treatment.—The internal remedies upon which the greatest reliance is placed are: *Ars.*, *Aur.*, *Arn.*. *Asa.*, *Hecla lava.*, *Hepar.*, *Mez.*, *Merc.*, *Phos.*, *Nit. ac.*, *Ruta.*, *Lyc.*, *Sepia.*, *Symph.* and *Sulph.*

The surgical measures are excision, *Nitric acid* or *potassa fusa* to the base to induce necrosis.

Lyc., *Sil.*, *Mez.* and *Ledum* cured exostosis in a boy eight years of age.

Hecla. lav. has been used by Helmuth with indifferent success.

Sepia. effected a cure in enlargement of the tibia in eight weeks.

Sil. has cured many cases of exostosis in my hands when all other remedies had failed.

Phos. has given me excellent results in exostosis of the head and face.

Cystoma in Bone is an expansion of osseous structure containing serous or gelatinous matter. It occurs in the upper and lower jaw; lower end of the femur; may be either unilocular or multilocular, and contains fluid or solid materials; it is the *osteo-sarcoma* of the old authors when the tumor consists of a bony shell filled with fibrous or fibro-plastic matter; when its contents are fluid forming a tumor in bone, they constitute a smooth, round or oval growth, *osteo cystoma*, and increase slowly with little or no pain; the skin covering them is normal in color and the veins skirting them are usually blue, enlarged and tortuous. They attain a much larger size than the preceding, and are seen principally in adults, and are the spina ventosa of the older writers. Pressure produces a peculiar crackling or rustling sound similar to that made by the pressing together of a broken egg-shell in the clinched hand, or the crackling of tinfoil.

Asa., *Phos.*, *Sil.*, *Calc.*, *Hepar*, *Staph.*, *Sepia.*, are the representative remedies in this type of the disease. After having employed one or more with no appreciable benefit, recourse should be had to surgical procedures.

Hydatids in Bone are of exceedingly rare occurrence, and consist of cavities formed in bone of various sizes in which large numbers of hydatids are lodged—both the acephalocyst and the cystecircus cellulosæ, have been found within these cavities, the former being the most frequent. These cysts become thin and expanded, resembling the ordinary fluid cystic tumor, the contained entozoa constituting the chief difference.

Treatment.—The remedies employed in these diseases from their extreme rarity comparatively, have not been fully tested as to their therapeutical importance. I would, however, suggest a reference to the following as the most appropriate to meet the indications usually presented, viz.: *Asa.*, *Calc. c.*, *Hepar*, *Merc.*,

Mez., *Phos.*, *Nit. Ac.*, *Sil.*, *Ruta.*, *Staph.*, *Sepia.* The surgical treatment is their removal, either by amputation, enucleation, or excision. If the cystic growth occurs in flat bones, the cavity may be scooped out and dressed from the bottom with *Mezer.*, *Symphytum.*, or *Ruta grav.* lotions, inducing the filling up of the cavity with healthy granulations.

Osteo-aneurisms, like aneurisms elsewhere, are of gradual growth, are elastic to the touch, oval in shape, without enlargement of the veins or discoloration of the skin. Its special signs are its pulsation and bruit; compression of the main artery leading to the part diseased, diminishes the size of the tumor and all movement and bruit ceases. These signs frequently intermit, appearing distinctly in the earlier stages and disappearing as it advances, or vice. versa. The true osteo-aneurism is only met with in articular ends of long bones.

Pulsating Malignant Tumor in Bones.—The pulsating malignant tumor, which is a malignant form of disease is frequently multiple and the pulsation and bruit occurs in more situations than one. The tumor takes on the character of malignant growth, which consists of a creamy, curdy, or soft, brain-like mass of great vascularity with constitutional contamination.

Treatment.—The internal treatment of these aneurismal growths has not resulted in anything like a satisfactory termination. I would, however, recommend the study of the following which seem to exercise a powerful control over that dyscrasia of the system which constitutes the germ force of their appearance and growth: *Calc. c.*, *Calc. fluor.*, *Asa.*, *Fluoric ac.*, *Graph.*, *Hecla lava.*, *Nit. ac.*, *Merc.*, *Sec.*, *Phos.*, *Sil.*, *Staph.*, *Therid.*, and *Sulph.* The surgical means are ligation of the main artery and in case of return, amputation. The thermo-cautery has been recommended but its good results have not been satisfactory.

Malignant Bone Tumors, Osteo-cephaloma or cancer in bone is the most common form of malignant growth invading the osseous structure. It originates in the spongy portions, its favorite seat being in the lower jaw and long bones; it is globular and lobulated, elastic and often semi-fluctuating; its varieties are *periosteal* and *interstitial*; the former affects principally the long bones; the interstitial is confined to the flat bones as a rule.

Symptoms.—The pains at first dull and deep-seated, soon become intense and lancinating; the volume of the bone increases, the soft structures soon become red and inflamed, the tumor softens and presents a sense of distinct fluctuation and crepitates on pressure. The external parts now become livid and dark red, ulcerate, and permit a portion of the softened growth to protrude in the form of a fungous; this is followed by a profuse discharge, thin and bloody, the system participates in the disorder, the lymphatics enlarge and the peculiar cancerous cachexy is evidenced by much constitutional irritation and exhaustion. Fractures are liable to occur if the disease is situated in the long bones, which adds greatly to the complication already existing. If encephaloid occurs as an *infiltration* in the spongy structure, no distinct circumscribed tumor is formed.

Treatment.—In the *early stages* of this affection much benefit will be derived from those remedies which are indicated in accordance with presented symptoms, among which are: *Aur.*, *Ars.*, *Bell.*, *Calc.* c., *Calc. f.*, *Caust.*, *Lyc.*, *Lapis. alb.*, *Merc.*, *Mez.*, *Phos. ac.*, *Nit. ac.*, *Sil.*, *Sulph.* and *Thuja.*

Purely surgical means do not promise any lasting impression on the disease after systemic infection, for the tendency is to return after removal, either at the site of the original disease or at some more dangerous locality. But amputation or excision in connection with the indicated homœopathic remedy, promises better results than any present known method of treatment.

Osteo-Myeloid, or Spindle-Celled Sarcomata, is sometimes met with at the articular ends of long bones, occupying the cancellated structure; is most frequent at the lower end of the femur and radius, head of the tibia and humerus, and in the jaw and scapula. It develops locally, tends to recur after removal; the more rapid its growth, the greater its malignancy and the probabilty of its return after operation. They grow slowly, are oval and lobulated, have an elastic feel, are firm, fleshy, and painless, and never ulcerate. The arteries supplying them are dilated. They contain spiculæ of bone with cysts of various sizes, mingled with mixed fluids of serum and blood.

Histological Elements—The cells are fusiform and oat-shaped from 1-300 to 1-1000 of an inch in diameter, and contain from two

to twelve oval nuclei, with nucleoli and resemble the cell structure of the fœtal marrow. The cell-structure is very abundant and a soft, gelatinous or colloid substance intermingles within. It is a semi-malignant growth and like the fibroid class, is liable to recur after removal.

Epitome of Treatment.—Arn., and *Ruta.* for contusion of bone.

Aur. mur., and *Merc. iod.*, for exostosis.

Asa., Merc., Mez., Aur., Arg. nit., Ac. fluor., Ac. phos., Phytol., and *Sil.* for inflammation and caries, with ulceration of bony structure.

Merc. prot., and *iod.*, *Ars.*, *Iod.*, *Sil.*, *Ac. fluor.*, *Symph.*, *Phos.*, *Ars.*, *Asa.*, and *Silicate of lime* for necrosis.

Sil., *Kali jod.*, *Kali bichrom.* for cranial nodes; *Merc. cor.*, for tibial; *Rhus.* and *Staph.* for soft nodes, and *Aur. mur.*, for hard nodes.

Aur., *Asa.*, *Merc.*, *Ruta.*, *Ac. nit.*, *Ac. fluor.*, *Ac. phos.*, *Staph.*, *Phytol.*, *Eupat. pur.*, for severe pain in bones.

Sil., *Aur. mur.*, *Mez.*, *Kali jod.*, for acute periostitis.

Cal. c., *Sil.*, *Ac. phos.*, *Calc. phos.*, *Merc.*, and *Sulph.*, for softening of bones.

Special Indications.—Acon.—As usual when inflammation exists.
Ars.—Burning pain—like an ulcer—boring.
Asaf.—Acute pain, changes to other kinds of pain on touching or pressure. Intermittent, like a plug, as from a shock.
Aurum.—Burning stitches; gnawing; excited by touch; caries of nasal bones; is an anti-mercurial remedy; caries and violent pains.
Baryta c.—In old cases, chronic cases. Scrofulous patients.
Bell.—Extreme sensitiveness; dread of being touched or jarred.
Calc. c.—Chronic; scrofulous; hard, bloated abdomen; coldness; sweating of hands and feet.
Iodine.—Proceeding to suppuration, which is very profuse.
Merc. v.—Pain as if broken, and usual symptoms; violent bone pains; swelling and redness of the skin; in caries and chronic ostitis, also in periostitis; in fact any disease of the osseus tissue; bone pains at night; no relief from sweating; [sweats easily.
Nitric. ac.—Mercurial cases. Prickling pain, etc.
Phos. ac.—Feeling, as if the bone was scraped with a knife; in non-mercurial ostitis; disposition to caries in the vertebræ; bone affections of children.
Silicea.—Threatening caries, with thin brownish, unhealthy suppuration; fistulas; brown, thin pus, excoriating and offensive.
Angustura.—Easily angered from slight cause.
China.—Great weakness and profuse suppuration.
Fluoric ac.—Syphilitic caries.
Ruta g.—Pains as if bones were broken or sprained; the skin erysipelatous.
Mecia. lava.—Osteo-sarcoma, particularly of jaws. Arrests growth but not proved curative.
Mezer.—Pains severe; burning pains. Pressure aggravates; skin of part brown and dry, surrounded by reddish blue; is particularly adapted to periostitis; before suppuration has set in; pains in the superficial bones and when the external portion is involved.
Phos.—Shining, painless, uninflamed tumor.
Silicea.—Cases proceeding to suppurate, with characteristic pus, etc.
Staph.—Ostitis with severe pains; bone and periosteum both affected; facial bones in scrofulous persons.

Other remedies may be needed in the beginning, or to complete a cure: *Bell., Ang., Phy., Baryta, Lyc., Sulph.*

Differentiation of Innocent and Malignant Bony Tumors.—Mr. Paget gives the following diagnostic rules for distinguishing these bony tumors, viz-:

"1st. The tumor is probably cancerous if its growth commenced before puberty, or after middle age, unless it be a cartilage or bony tumor on a finger or toe near an articulation.

"2d. If a tumor has existed, on or in a bone, for two or more years, and is still of a doubtful nature, it is probably not cancerous or recurrent.

"3d. If a tumor, on or in a bone, has doubled, or more than doubled its size in six months, and is not inflamed, it is probably cancerous or recurrent; and this probability is increased if among the usual coincidences of rapid growth, the veins over the tumor have much enlarged, or the tumor has protruded through ulcerated openings, bleeds and profusely discharges ichor.

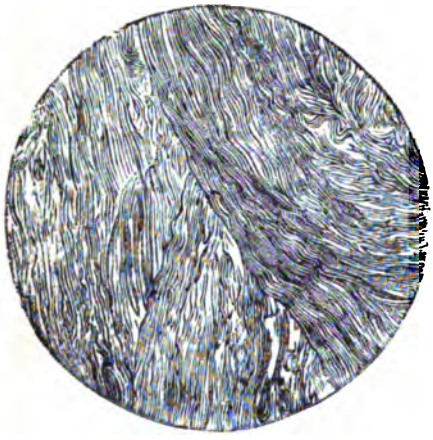
"4th. If in any such tumor not being inflamed, the lymph-glands near it are enlarged, it is probably cancerous, and still more probably if the patient has lost weight and strength to an amount more than proportionate to the drainage of health by pain, or fever, or other accident of the tumor.

"5th. A tumor on the shaft of any bone but a phalanx is rarely innocent, and so are any but cartilaginous outgrowths on the pelvis, or any but the hard bony tumors on the bones of the skull."

Of all the malignant diseases in bone the encephaloid is the most frequent. Its varieties are the *periosteal* and *interstitial;* the periosteal affecting the long bones, and the interstitial the flat bones.

Fibroma.—The connective tisue from which these tumors are developed, exists in all parts of the body—no structure is exempt from their formation. They occur most frequently in the cutis, sub-cutaneous areolar tissue, and upon the periosteum, antrum and nares; in the mamma, uterus and testes. They grow slowly, attain large size; their surfaces are smooth, hard, and sometimes nodulated, without discoloration; are painless except when pressure is made upon a nerve.

Histological Elements.—They are composed of very tough and firmly interlaced fibrous tissue, arranged in wavy bundles, or in concentric layers around distinct axes; a few imperfectly developed cells and nuclei are usually scattered through their substance.



Pathology.—When cut into they present a white, glistening ligamentous appearance, and finally disintegrate and break down into a semi-fluid mass. The integuments become disorganized, inflame and mingling with the contents of the tumor, produce a fungous growth. Fibromata are not always composed of a single element. Either originally, or by subsequent progressive or retrogressive changes, they are found to assume a variety of forms and of combinations which render it necessary to recognize several sub-divisions. Thus, we find under the general head of fibromata, are included the following varieties, whose histological differences would seem to possess some important clinical significence; the fibro-plastic, fibro-cellular, fibro-muscular, fibro-mucous. fibro-neuroma, and glioma.

Fibro-plastic.—These tumors resemble most other fibroids in their situations and modes of development. They commonly occur in young or middle-aged persons, are painless, originate without any known cause, are more rapid in their growth than the purely fibrous tumor, and have the tendency to return after extirpation, and in some cases assume a malignant or semi-malignant type. They are often associated with myeloid growths. The microscope reveals the fact that they are different from other fibromata, in this, that they consist almost exclusively of elongated, fusiform cells, containing usually a single oval or oat-shaped nucleus and nucleolus and are very liable to return after removal, in the cicatrix. According to Libert they are of two varieties, the soft and the hard.

The *soft* variety resembles encephaloma, though more elastic and not so readily torn. It yields when cut, a clear, serous juice, and possessing the characteristics of flabby granulations resembles the formations around carious bones.

The *hard* variety or real sarcoma, is of the consistence of muscle or rather kidney, but are not so firm as the fibrous tumor; the color varies from a reddish yellow to a deep fleshy red, the growth being homogenous and finely grained; ecchymotic spots are intermingled with fibrous bands which show alternating tints in patches and contain many blood vessels. Externally they are smooth, lobulated and globular, and are situated in the skin, sub-cutaneous and sub-mucous areolar tissue; in the deep muscles of the thigh; in or upon bone, especially of the lower jaw; in the dura mater; in the mammæ, and in the lymphatic glands. They grow slowly, attain a large size, are usually single, may occur at any age, and are oftentimes attributed to a syphilitic taint. The only reliable treatment is extirpation. *Kali jod.* and *Sil.* have been given with success.

Fibro-Cellular tumors grow more rapidly than the pure fibrous growths, have an elastic feel, and are formed especially in the nose, and are called the soft polyps. They are also seen in the external meatus of the ear, vagina, and in tissues divested of fat. Rokitansky calls them a *gelatinous sarcoma*; Voight a *connective tissue tumor;* Muller a *cellular fibrous growth*, and Virchow a *myoma*, one of the endless varieties of sarcoma. Billroth classifies them as belonging to the *adenomata*, in consequence of their occuring in the mucous membrane of the nose, rectum and other portions of the large intestine. He says, they consist, in a great extent, of elevated and newly formed glands of the mucous membrane, whose closed ends sometimes dilate the mucous cysts. In children these soft polypi occur more frequently in the rectum and large intestines; from puberty to about the twenty-third year of life, they have a preference for the mucous membrane of the nose and fossæ of the upper jaw, and about the age of thirty in females they are most frequently met with in the mucous membrane of the uterus. Remedies that have effected the best results are *Calc. c.*, *Hepar*, *Merc.*, *Phos.*, *Sepia*, *Teucrium*, *Kali jod.*, *Staph.*, *Sang.*, and *Sil.*

Fibro-Myoma.—This tumor belongs to the more solid types of fibromata; when subjected to the microscope there is found "a fine areolar stroma, composed of undulating and interlacing fibrous glands, in the midst of which are numerous nuclei and more or less elongated fibrin cells, which Virchow calls *muscle* cells, in consequence of their elongated and spindle-shape appearance. He arranges them, therefore, under the *myomata* and fibro-myomata, like the pure fibromata. These tumors are generally benign in their character, and do not return after thorough extirpation.

Fibro-Mucous Tumor, or *myxoma* of Virchow, is another variety of the fibro-cellular tumor in which the connective tissue is so extremely delicate that it resembles the connective tissue of the vitreous humor, and the fœtus *in embryo*, or the whartonian jelly of the umbilical cord. When cut into, there is presented a yellowish, opalescent, jelly-like surface, which subjected to the microscope, display rounded, oval, elongated or branched corpuscles, with a finely fibrillated connective tissue. The external surface of these growths present a somewhat uneven surface; the integument is frequently discolored; under pressure they give a soft elastic feel, and they either increase rapidly and finally attain a large size, or they may ulcerate and bleed, with disintegration of considerable portions and final sloughing. Having a greater tendency to return after thorough removal than other varieties of fibromata, they are classed as *recurrent*.

Fibro-Neuroma.—This growth consists in most cases of connective tissue fibres distributed among the nerve filaments. So close is the analogy between this tumor and that composed of nerve elements, that Paget and Moore say it is impossible to distinguish the one from the other. These tumors may be developed upon any point of the cerebro-spinal nerves without apparent cause, the nerves of the special senses, and those of the ganglionic system being rarely affected. Their most usual seat is upon some of the peripheral nerves, especially of the lower extremeties, and when situated in the superficial areolar tissue, they are known as *painful sub-cutaneous tubercles.* They sometimes grow to about the size of a hazelnut, but usually only attain the dimensions of a pea or bean. They are hard, tense and movable,

except in those cases when they become incorporated into the superincumbent skin; they are extremely painful and are generally subject to severe, lancinating paroxysmal pains. The skin is rarely discolored, but at times there is present a shining, vascular and arborescent appearance.

Fibro-Neuroma Traumatica.—The traumatic neuroma have their seat in or upon the divided portions of nerves, forming at the point of nerve division a bulbous enlargement or growth, which can be distinctly felt and is exquisitely painful to the touch and often gives rise to hysterical symptoms in sensitive organisms. They are generally encased in a capsule of moderate firmness, but are never embedded beneath the neurilemma, or between the fasciculi of nerves. Extirpation is the only reliable and prompt method of cure.

Glioma.—Virchow defines this variety of tumor as a soft vascular tumor, originating in the neuroma, and is composed of delicate interstitial connective tissue of nerve and connective-tissue corpuscles. During the periods of infancy and early childhood, the retina is the favorite seat of this affection. The complete and early extirpation of this growth is the most successful method of cure, although in many cases where appropriate internal medication has been employed, the growth has speedily recurred with a rapidly fatal termination.

Treatment of fibromata consists in many instances, in relief by operative interference; the tumor having been once thoroughly removed, seldom recurs. The recurring fibroids present no symptoms, no anatomical or other peculiarities before removal, by which they can be distinguished from the innocent variety. The discussion of these growths by internally administered remedies, has of late occupied the attention of the homœopathic profession, but with the exception of a few published cases, no very great amount of benefit has been derived from such treatment alone.

Belladonna was highly recommended by the late Dr. Bowers for these growths when they occupied the connective tissue of the mammæ, accompanied with pain and induration.

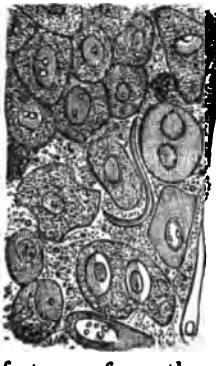
Calc. phos. is useful in those sensitive systems when fibromata appear in different parts of the body, and where they are dependent upon depressed vital force.

Conium has been highly spoken of by Dr. Gilchrist as curative of the fibro-neuroma, and a case is reported where success followed the use of the remedy. He also recommends for the fibro-plastic tumors *Ars.*, *Lach.*, *Merc.*, *Sang.*, *Sil.*, *Teucrium*, and *Sulph.* Prof. Dunham reports cases of fibro-cellular growths cured by *Calc. c.*, *Teucrium.*, and *Staph.* Dr. John Pattison, of London, has treated successfully this variety of fibromata, with a snuff of powdered *Rad. Sanguinaria canadensis.* Dr. John Butler has employed with marked success *electrolysis*, not only for the fibromata, but other varieties of tumors; he says the disappearance of fibrous tumors "can be caused by producing a slough within the tumor, not sufficiently large, however, to cause its entire destruction, but of such dimensions that will be too large to be readily absorbed. Such a slough will act as a foreign body, and will cause inflammation, followed by suppuration, which changes the morbid growth into an abscess, which either can be opened or allowed to discharge itself spontaneously, and so the tumor is got rid of." In those cases that will not admit of such a procedure, he introduces "small insulated needles into several parts of the growth, using a current just strong enough to cause small eschars or coagula to form around the needles, which interfere with the nutrition of the growth by acting as barriers to the blood supply, and which are not sufficiently large to cause suppuration, but after a time are absorbed; besides this, the action of the current exercises its catalytic effects, and assists in promoting absorption of the tumor." Extirpation or thorough evulsion of the tumor is also practised to a large extent in the removal of these growths, and surgeons generally are more partial to these procedures than the others first mentioned. I have operated several times on the "recurring fibroids," and have witnessed the painful appearance of their return when I was flattering myself that the cure was entire and complete. In a good many instances I have seen these morbid growths disappear under the use of some of the medicines recommended above, and when the hasty method is not acceptible to the patient, I would advise a careful study of the pathogenesis of the remedies above indicated, and the selected remedy employed for curative purposes. I believe

the day is not far distant when all these morbid growths will succumb to the potent and curative action of homœopathic remedies, and their cure will be effected by these means with as much precision as are at present the most tractable diseases.

Enchondroma.—*Synonyms*, osteo-chondroma, osteo-sarcoma, or cartilaginous tumor, is developed from connective tissue and is often associated with the periosteum. especially of the bones of the hand, or it may occur in the soft tissue of the glands, as in the parotid or the testicle. Enormous growths have occured in the femur, scapula, and pelvis; in its simplest form it is almost identical with fœtal cartilage.

Histological Elements.—Under the microscope is seen a stroma, which may be hyaline, granular, or slightly fibrillated, and in which there are large, round, oval or caudate cells, containing nu-



clei, which are 1-700 to 1-1500 of an inch in breadth; the cell wall may be distinct from or blended with the inter-cellular substance. The nuclei are mostly single, rarely double, with oil granules in abundance, with here and there projections like those of cartilage in process of ossification. Its chemical properties are phosphate of lime and *chondrine*, which is a peculiar variety of gelatine, extracted from the temporary cartilage of the fœtus or from the adult cartilage by being boiled in water.

Symptoms.—Cartilaginous tumors are firm, elastic, smooth, and nodulated; occasionally soft, and may be mistaken for cysts; they are developed *within* the bones, (when they are oblong, oval or fusiform) which they cause to expand into a thin shell; or *upon* their surfaces beneath the periosteum when they are irregular, nodulated and elastic, and present a skeleton of light, leafy plates with spiculæ of bone shooting through their substance; or they may become ossified from internal centres of ossification; they appear in the early period of adult life, are often multiple and sometimes hereditary, grow slowly as a rule and are unattended with pain, and rarely return when thoroughly removed: they often cease growing under systemic improvements without change of

structure. If not removed they involve the skin, ulcerate and slough; fistulous openings form, and a viscid ichorous fluid discharges; ossification and disintegration may co-exist in different parts of the same tumor, or calcareous and fatty degeneration may also occur.

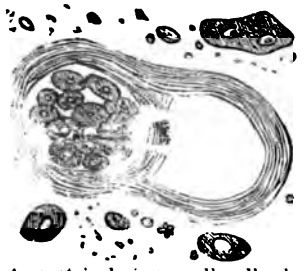
Treatment.—The remedies that have proved most efficacious in the cure of this disease are: *Arg.*, *Aur.*, *Sil* and *Sulph.* More cases are reported cured by *Sil.* than all other remedies. The surgical treatment is excision, when the tumor is formed *upon* the bone and the removal of all bone found diseased. Free incisions or removal of a portion of the walls, followed by injections of *Mez.* and *Symph.* have occasionally succeeded in the cystic form of the affection. Amputation in certain cases when the tumor develops within the bone is also to be considered. After careful removal by resection, these tumors seldom return. Much benefit will be experienced by attention to general conditions of the system, including hygienic and therapeutic measures that promote health and rectify faults of constitution.

Epithelioma is a tumor originating in the stratum malpighii of the skin, and in the epithelium covering the mucous and perspirable surfaces of the body, the prepuce, lips, vagina, cleft of the nates and axilla. Sometimes it begins among the deeper structures, and at others, especially at old age, it is developed from the irritation of a wart, old eczema, papilloma, smoking of a pipe, or picking of the lip. It increases slowly, invades adjacent tissues, extends deeply and ultimately destroys them and perhaps the life of the patient.

Pathology.—It begins as a wart, fissure or tumor, and spreads by infiltration, and is more fatal on the lip, tongue or penis. Soon there appears a soft, itching vascular spot with desquamation of cuticle, or a patch covered with a dry crust or scab, with hypertrophied papillæ, resembling warts or excrescences; these sprout and resemble cauliflower growths, with narrow necks, or they may have broad, flat and low bases. The connective tissue is subsequently invaded, the proliferation of cells downward assume various forms, and with the rapid increase of new cells and the circumferential pressure of the surrounding connective tissue, they are forced to occupy the least possible space, which form the

concentric and stratified layers, termed "cell-nests"; epidermic globes or tubercles of histological authors. The peculiar characteristics of these tubercles or globes is their hardness. In time, however, they undergo a necrobiotic process, by pressure and an arrest of vitality and finally ulcerate and destroy the invaded tissues. It occurs after the age of 40. Men are more liable to it than women and it is homologous in its elements.

Histological Elements.—The microscope exhibits layers of epithelium arranged in connective circles, around and between the papillæ, intermingled with yellow fibrous tissue thickly studded with epithelial cells, with their nuclei and fibro plastic matter. They are arranged into "cell-cylinders," constituting the "broad nests" or "pearly nodules," which are thus formed by continual cell infiltration and pressure constantly exerted upon them.



A, cyst inclosing small cells; b, large round cells; c, empty cyts. (From DaCosta,)

Treatment by internal remedies in this disease has been more than ordinarily successful. The following have several cures reported by their use: *Acetic ac.*, *Apis m.*, *Arg. nit.*, *Aur.*, *Carb. an.*, *Carbol. ac.*, *Clem.*, *Con.*, *Chelid.*, *Hydrast*, *Hydrocotyle*, *Kali bi.*, *Kreas.*, *Puls.*, *Sulph.*, *Stilling* and *Thuja.*

The surgical treatment is enucleation and excision. In case the knife is resorted to, the utmost care should be taken that *all* the diseased part is removed, the return of the growth thereafter is not likely to occur if the appropriate remedy is employed, viz.: *Hydrocot.*, *Phos.*, *Sep.*, *Sil.*, *Hydrast.*, *Thuja.*, for the stationary period; *Apis.*, *Ars.*, *Bell.*, *Con.*, *Hydrocot.*, and *Merc.*, for the painful stage; *Ars.*, *Bell.*, *Caust.*, *Clem.*, *Lach.*, *Hydrocot.*, *Hyd.*, *Still.*, *Carbol. ac.*, for the ulcerative stage.

Papillomata are found where the mucous membrane terminates in the tegumentary; at the angles of the mouth, upon the lips, tongue, in the external auditory canal, in the larynx, at the verge of the anus, upon the glans penis, about the meatus urinarius of the female, upon the labia, vagina and os tincæ. When growing from mucous membranes they are soft and highly vas-

cular, like cock's-combs; each separate papilla presenting a tuberose or leaf-like form; when large numbers are hypertrophied and aggregated together, the surface looks granular, the papillæ being separated by vertical fissures into lobes and lobules. These growths sometimes arise from the matrix of the nail and project between the integument and extremity of the nail. Whenever these tumors are associated with a cancerous degeneration, they have narrow and pedunculated bases.

Treatment.—The treatment of papillomata unaccompanied with cancerous degeneration consists of removal, either by the knife, or scissors, evulsion, enucleation, or cauterization. If they are of *syphilitic* origin, due attention must be given to the remedies recommended under that chapter. Possessing a low degree of vitality, their removal may be effected by escharoties of various kinds, or by the application of *Thuja* tincture, *Nitric* or *Chromic acids*, *bi. sulph. of Iron*, *Lapis calaminaris*, etc., etc., repeated at intervals until the growth is entirely eradicated.

Ac. nit., *Thuja.*, are leading remedies if they make their appearance after an attack of gonorrhœa.

Cinnab., *Nit. ac.*, *Phos. ac.*, *Staph.* and *Thuja.* when complicated with syphilis.

Thuja, *Staph.*, when they are exuberant, like mulberries or cauliflowers.

Lyc. and *Nit. ac.*, when they have pedunculated bases.

Sepia., for large, hard verruccæ. *Sulph.*, for soft spongy papillomata.

Sabin., when itching and burning are intolerable.

Nit. ac., for soft, moist, warty excrescences with thin epidermis.

Warts, Verruccæ, are those papilliform growths that occur upon the integument, and especially upon the hands of children, between the periods of infancy and puberty. They are seen singly and in groups, are said to spread by contagion, especially those which furnish a moist secretion from their surfaces. They are occasionally seen in old age, when by some rough manipulation or scratching they degenerate into a form of semi-malignant ulcer. The simple wart is composed of epidermic cells arranged in a papillary form.

Treatment.—They should be painted twice a day with *Thuja.*, at the same time the remedy should be given internally. When *Thuja.* does not succeed, *Rhus.* may be substituted in the same manner.

Sulph. once a day for a week or two is an excellent remedy when the warts upon the hands are numerous and obstinate. It should also be used after other medicines, to eradicate the tendency to recurrence. *Dulc.* is also highly recommended when they appear in numbers upon the body. *Ant. c.* has also proved curative in certain cases.

Calc. c., *Clem.*, *Graph.*, *Hepar*, *Lyc.*, *Petrol.*, *Plumb.*, *Sepia*, and *Sil.* may be consulted when other remedies have failed to remove them. The hard scaly warts may be removed by saturating the growth with glycerine and applying warm water by means of a pledget.

Horny Growths.—*Cornua cutanea.*—These excrescences are sometimes seen growing upon the integument covering the face and scalp; occasionally they grow to a considerable size and have attained several inches in length. They strictly belong to the dermata variety of tumors, and consist of moderately enlarged papillae, with an excessive epidermal formation. In shape they are usually conical and bent upon themselves resembling ram's horns. Their surface is marked by rough rings, indicating the different stages of growth; at times they are "knotted and covered with small pearl-like scales." In certain cases the epidermic deposits of which they chiefly consist, project from sebaceous cysts or hair follicles; but their character is essentially the same as those examples which arise from the tegumentary papillæ.

Horns upon the Nails.—The nails of the great toes are subject to hypertrophy in consequence of long continued irritation of the sub-ungual matrix, occasioned by pressure which produces an excessive deposit of epithelium. They appear "as large convex, or bosselated solid masses, and examples are reported in which they have risen to the height of one or two inches." They are sometimes met with in old persons in our public hospitals, and women are more subject to them than men.

Treatment.—The only radical treatment in such cases is excis-

ion of the hypertrophied nail, including its matrix. I have amputated the toe in two cases, when all ordinary treatment such as scraping, filing, immersion of the toe in alkalies, and finally excision of the nail failed in affording perfect relief.

Clavi.—*Corns.*—These pestiferous growths are the result of wearing tight or badly fitting boots; the pressure of the boot occasions corns, projections and sometimes hypertrophy of the joints. This pressure generates inflammation of the cutis, and consequent excessive development of the epidermic cells, which accumulate towards the center of the surface irritated, producing a dry and hardened mass, painful and conical in shape, the apex of the cone impinging upon the bone of the toe. These are termed the *hard* corns, the *soft* corns, being situated between the toes where they are kept continually moist and soddened with perspiration.

Treatment.—This consists first, in restoring by mechanical measures, the vitiated position of the toes, and secondly, by adapting to the foot a proper fitting boot, which should have sufficient width and length to permit unrestrained motion to the toes. Then soak the foot in warm water till the surrounding skin becomes soft, when the hard base of the corn should be gently extracted by the finger nail or other dull instrument and the thickened skin pared off without wounding the neighboring tissues. Now dress the corn with *Arnica* lotion (30 drops of the mother tincture to two ounces of water); next morning apply a patch of arnicated plaster; or paint the part with perchloride of iron or castor oil. Repeat this dressing for two or three weeks or till the inconvenience is removed. A valuable temporary dressing is the *arnicated amadon or felt plaster* applied to the corn; a hole of larger size than the corn having been made into the plaster, so as to protect the growth from pressure of the boot. If internal treatment is necessary, *Calc. c.* and *Sulph.* are exceedingly efficacious remedies; the sulphur to be taken twice a day for ten days, then waiting two or three days when the *Calc. c.* should be repeated in the same manner. *Sepia, Ant.*, and *Graph.* in my hands have proved excellent remedies.

Soft Corns.—Can be succesfully treated by carefully removing the thickened skin as above directed and applying a few

drops of diluted *Arnica*, and placing a layer of cotton wool between the toes, changing it daily. When they become very large and horny, a visit to the chiropodist is often a grateful and permanent benefit to the suffering pedestrian.

Bunion is the term applied to those hardened elevations which sometimes form upon the inner and upper margins of the meta-tarso-phalangeal articulations of the great toe, and at corresponding points of the smaller toes. The only difference between them and corns is that they occupy a greater surface, the epidermic layer is thinner, and the distinct bursal sac that is almost always present beneath the callosity. In very old corns this bursa is occasionally found beneath the apex of the epidermic core. They sometimes become inflamed and occasion much pain and inconvenience, and arise from the causes that produce corns.

Treatment.—In recent cases when the sac is thin, the contents may be evacuated by the aspirator and an injection of *Tinct. Iodine* thrown into the cyst. In old cases where the bursa becomes thickened, this proceeding is unavailable, but much benefit will ensue by changing the direction of the toe. This is accomplished by wearing properly shaped boots, made with the inside of the sole straight from the heel to the toe. The treatment locally is the same as that recommended for corns. When there is a tendency to erysipelas, *Ruta.* will be found very serviceable. When matter forms, *Hepar*, followed by *Sil.*, will give satisfactory results. *Ver. vir.*, applied by means of a pledget gives rapid and lasting relief.

Keloid is closely allied to the warty structures already spoken of, and consists of a pinkish-white, fibro-vascular tissue, which is occasionally met with in old cicatrices, caused by a burn, as an outgrowth of that process, and not unfrequently recurs after removal. Alibert, who first described this affection, classified it among the dermata. Addison recognizes two varieties of keloid, the one occurring in the integument without any recognizable cause, and the other as the resultof previous lesion. It has occurred after excision of a fatty tumor, (Hamilton) and is more frequently met with in the black than in the white race. It is round, spheroidal and cylindrical in form; possesses hard or slightly elastic, smooth elevations, and extends from a common centre

outwards and from its fanciful resemblance to the crab, is called keloid It is accompanied by a burning, striking pain with an intolerable itching. Its progress is slow but continuous and seldom results in ulceration, and a peculiarity of the growth is that it recurs after removal.

Treatment.—The treatment of this affection so far has not met with any marked success medically or surgically. Excision has been employed in some cases, both with the knife and the ecraseur, but the growth as a rule has returned. For the itching and burning *Ars.* seems an appropriate remedy.

Carcinoma is the malignant type of tumor; implicates the system, affects the neighboring structures, and is prone to return after removal either at its original site or in some remote part of the body. The primary origin of cancer lies in a peculiar deviation from the normal standard of nutrition, which acts as a predisposition thereto; or it may depend upon a hereditary predisposition not necessarily allied to *impaired health.* This does not seem to act as a principal factor in its development, for we frequently see tumors in unhealthy persons which do not show the slightest evidence of degeneration. The distinction between true carcinoma, and the benign tumor in reference to auto-infection is this, in cancer the adjacent structures are *infiltrated* with the cancerous or neoplastic product, while in the benign tumor the surrounding tissues are *pushed aside*, producing a separation of tissue. Another peculiarity of cancer is the glandular enlargements that are dependent upon its growth. Suspicion rests upon every tumor that is accompanied by lymphatic or glandular enlargements. See differentiation of malignant and benign tumors, page 115.

Etiology.—Cancerous growths differ from all normal structures. It is a neoplastic product, has an organization peculiar to itself and never attacks a truly healthy system. Its cells are seen compacted together without any intercellular substance, and lying in the spaces of a fibrous stroma. They are heterologous and present in a high degree clinical marks of malignancy; are more frequent in women than in men.

Histological elements.—The cells that are met with in cancer

vary greatly, there being in fact *no distinct typical cancer cell*, these cells being varieties of epithelium, both in their stage of development as well as in the process of formation; the *multiplicity*, the *proliferation*, the *heterology* of the cells, is the strongest evidence of the neoplasm. Thus the cells may be large or small, round or oval, regular or irregular, pysiform or caudate, anything in fact except a harmonious cell; development; between the stroma is found a peculiar milky-white, or glairy fluid called "cancer juice," more or less discolored by being tainted with disorganized products. These cells are often loaded with oil globules and granular matter, and they serve as a warning to the surgeon that he is cutting *into* the tumor and not *around* it. Sometimes these cancer cells undergo a fatty degeneration termed "saponification." There are three leading types or varieties of cancer, viz: *scirrhus*, *encephaloid* and *colloid*.

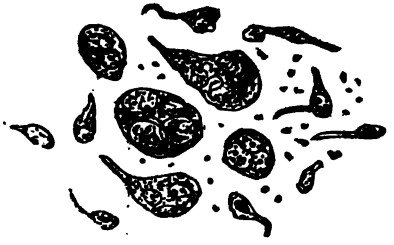
Scirrhus or hard cancer is a disease of adult life, and is the most frequent form of the disease; more common in women than in men and it attacks the mamma and uterus. It begins as a small, hard lump which slowly and persistently increases in size; it draws to itself and appropriates, by a kind of concentric attraction, the surrounding structures.

Diagnosis.—The skin becomes puckered, the nipple retracted, and the tumor unlike the benign form, ceases to glide over the deep-lying tissues, holding all the structures within its grasp by adhesions and inflammatory implications. The pain is of a burning, shooting, darting character; soon the skin becomes involved in front, below, and adjacent thereto, the muscles become implicated by the inflamed and cancerous connective tissue; the neighboring lymphatic glands are enlarged, which are connected with the growth by a line of swollen absorbents; gradually the skin or membrane covering the tumor, becomes discolored and assumes a dark or purplish color, and finally breaks and ulcerates, followed by an offensive discharge; the pain increases in severity, the patient shows signs of suffering, emaciates, becomes dispirited and assumes a peculiar leaden and sallow complexion. Soon, secondary deposits of a malignant type form in other parts of the body, probably in the uterus, lungs, or liver, and the patient gradually sinks away, worn out

by incessant pain and continued implications and profuse discharges.

Pathology.—A section of the scirrhus tumor, presents a dense and tough structure, creaking as the knife passes through, the cut surfaces giving a white, glistening, satiny appearance, intersected by bands of fibrous tissue.

Histological elements.—There is seen an abundant fibrous stroma containing cells of epithelium, and scraping the cut surface, there exudes a peculiar fluid called "cancer juice," that contains the cells which are indicative of cancer. This tumor is not of *large* growth; after it has attained its full development, there is a shrinking and puckering of all the tissues implicated, and a growing hardness. In doubtful cases my plan is to use the exploring needle or an aspirator and examine its histological elements.



Encephaloid, or soft cancer, is the most acute and malignant variety of this disease. It differs from scirrhus both in the rapidity of its growth and the scantiness of its fibrous stroma. It attacks organs often unknown to scirrhus; grows rapidly and attains great size; the structures that seem most inviting to its growth are the testicles, bones, and muscles of the extremities, cavities of the face, breast and abdomen. They are exceedingly vascular, and throw out a prolific fungus which is subject to constantly recurring hemorrhages, producing cachexy and death. They occur at all periods of life; in the young as well as in the aged. Their type of malignancy is more intense, their cachexy more early developed, and their termination more speedily fatal than in the scirrhus form.

Diagnosis.—It begins as a soft, smooth, lobulated tumor, slightly elastic to the touch, and may be mistaken for fluid. It grows quite rapidly, pushing towards the surface. The overlying skin shows the veins skirting it dilated, with more or less œdema, which soon ulcerates and forms the large fungoid protrusions hitherto mentioned from which there escapes an offensive dis-

charge. In very vascular tumors, oftentimes a decided pulsation may be felt and a bruit detected by the aid of the stethoscope.

Histological elements.—To the unaided vision it resembles brain substance, from which it derives its name. It possesses but little fibrous tissue, but an abundance of cancer juice. Its cells under the microscope are seen to be irregular in outline, imperfectly formed, loosely connected and disposed to fatty degeneration. It disseminates itself rapidly and soon leads to a fatal termination.

Colloid or Gelatiniform Cancer.—Synonyms, alvœlar or gum cancer. This form of cancer occurs more frequently in men than in woman; appears in middle life, and is rarer than any of the preceding varieties. Its chief points of attack are the mamma, stomach, rectum, bones, ovaries, and intestines, and it is sometimes found blended with other varieties of the disease; recurs after removal, and is frequently hereditary; its growth and multiplication is simply enormous. Prof. Helmuth has "removed two pailfuls from one patient, and in a second case * * * about sixteen quarts."

Histological elements.—It consists of a peculiar arrangement of the fibres of its stroma, in large circular outlines, filled up with semi-transparent mucoid substance, in which are seen large cells of various sizes and shapes, with rounded, flat or oval nuclei, hence its name, "alvœlar cancer." Lying in the interstices of these fibres, is a transparent jelly-like substance, resembling boiled starch, ordinarily of a slight bluish color, but sometimes of an opaque and brown appearance, resembling decomposed tuberculous matter.

It is said of this variety of cancer that it is the connecting link between carcinoma and cystic diseases of the ovary.

Melanosis.—When these two latter varieties of cancer are distinguished by the presence of *pigmentary* matter, writers have classified them as a distinct variety under the name of melanosis or *black cancer.*

Treatment.—All allopathic authorities, with a very few exceptions, speak of cancer as an incurable disease by internal remedies, their treatment resolving itself into "the improvement of the general health and the nutrition of the body by hygien-

means, good nutritious diet and tonic medicines." (Bryant). Constitutional treatment, say other of their authorities, "has no power either to disperse the tumor or to arrest its growth." Their only hope lies in early and complete removal. This is the unsatisfactory condition of the allopathic school in the treatment of cancer, and by the scalpel, it is claimed that "it is seldom indeed that a cancer can be said to be cured by extirpation." (Clarke.)

The homœopathic literature on the contrary is full of brilliant cures effected by medication. Drs. Helmuth, Bayes, Marshall, McLimont, Pease and others adduce cases without number successfully treated and cured by internal remedies, and I can testify to the success attending internal medication in scores of cases. The most important remedies are the following: *Apis.*, *Asa.*, *Aurum met.*, *Merc.*, *Ars.*, *Ars. jod.*, *Bell.*, *Brom.*, *Bry.*, *Clem.*, *Calc. c.*, *Carb. an.*, *Carbol. ac.* *Carb veg.*, *Chin.*, *Cedron.*, *Con.*, *Cundur.*, *Hyd.*, *Hydrocot*, *Galium ap.*, *Kali*, *Lach.*, *Phy.*, *Phos.*, *Merc. bi. jod.*, *Nit. ac.*, *Lapis alb.*, *Mur. ac.*, *Sil.*, *Thuja*, and *Sanguin.*

The Local Treatment of Enucleation has found many friends as an external expedient. Drs. Marston and McLimont, Pattison and others, have removed cancerous tumors by pastes applied locally, consisting of arsenic and chloride of zinc, or a paste composed of "powdered hydrastis root, chloride of zinc, flour and water of equal parts," to which may be added one part of stramonium extract if desired. Injections of the first dilution of acetic acid, topical applications of bromine, carbolic acid, congelation, compression, electrolysis, the ecraseur and ligature have their especial advocates.

Excision.—Far above all local expedients for its removal is the knife under a suitable anæsthetic, if employed before *fixation* of the tumor and previous to actual *systemic* contamination. Here is where the homœopathic surgeon excels his allopathic peer; by removing the disease locally, preventing increase and multiplication of growth, by ridding the system of the proliferating germs and removing the local fermenting and disseminating growth, while the remedies he employs internally are curing the causation of the affection constitutionally. The success attend-

ing well directed homœopathic medication far exceeds the hygienic and general constitutional treatment of the old school alone. The treatment of the homœopathic school certainly exercises a more beneficent influence over this terrible disease than any other system of medicine.

Dr. Marston in a recent work recommends the use of arsenic as a topical application. His formula is two drachms of arsenious acid, to one drachm of mucilage of gum acacia well mixed into a thick paste. Prof. Helmuth says he has used this application "with success in the treatment of epithelioma."

Dr. Michel's famous preparation, for which Dr. Bell paid him 25,000 francs, and subsequently made it public, is the following, viz.: Asbestos, as soft and free from grit as possible, is rubbed between the hands to the finest powder, and then mixed thoroughly with three times its own weight of strong Sulph. acid with a silver spatula till a mass is formed. It is then applied to the cancerous growth, taking care to protect the healthy parts by a zone of collodion and pads of linen. Rapid destruction follows with but little pain. All oozing is to be removed, and after 12 or 14 hours remove the first, and apply a second lotion of smaller size and let it remain for 12 hours, and the process is completed, and the parts are allowed to heal. Dr. Bell favors this process, and thinks it possesses considerable advantages over extirpation by the knife. The fetor arising from ulcerating cancerous tumors may be greatly diminished by solutions of *Carbolic acid*, *Condy's disinfecting fluid*, and poultices of powdered *charcoal* or *yeast*, *Labarraque's solution*, and *Chlorine*, *Chlorate of potash*, and *Glycerole of Tannic*, or of *Carbolic acid*. I have used *Galium ap.* with much success in cancer of the uterus, and those occurring inside of the mouth. *Bromine*, *Ozone*, *Iodine*, *Nitrate of Lead*, and *Permanganate of Potash* are valuable adjuncts for the comfort of the patient, and the relief of suffering.

Constitutional treatment.—The treatment of cancer, to be efficient, should be commenced as early as possible, and the use of homœopathic therapeutics have done much towards robbing this dread malady of the suffering and loathsomeness heretofore attending its existence. Helmuth cogently remarks "that there are certain medicines employed homœopathically that can arrest

cancerous formations," and the records of our periodicals report very many cases of this disease cured by the properly selected similimum. Our remedies exercise great curative influence over certain forms of cancer, and in their early stages of development have effected remarkable success. In the severe types of the malady and in the later periods of growth, they mitigate the sufferings attendant upon the disease, prolonging life very considerably, and smoothing the otherwise miserable pathway to the grave. The remedies that have produced the most valuble results in my hands are: *Hyd.*, *Ars.*, *Bell.*, *Con.*, *Phy.*, *Carbo. an.*, *Galium.*, *Clem.*, *Lach.*, *Phos.*, *Lapis alb.*, etc.

Hydrastis Canadensis.—This remedy has been quite extensively used by the practitioners of our school, who gained their knowledge of its medical virtues from "eclectic" sources. "It is this medicine," say Drs. Marston and McLimont, "that we chiefly rely upon in our treatment of cancer; usually putting our patients under a course of it for a month or so before commencing the enucleation of the mass. Our doses vary from one to two drops of the pure tincture to half a drop of the sixth dilution, the lower forms being used chiefly in those cases in which the cachectic condition is fully marked; and we must confess that we know of no medicine which has caused so great an improvement in the general health of our cancer patients. We continue the medicine, unless intercurrent symptoms forbid, throughout the whole course of treatment and for some weeks after its completion." Dr. Pattison, of England, has used this remedy in the treatment of cancerous diseases with exceedingly good results. My observations in regard to its sphere of action correspond with those of Dr. Bayer, who says "my experience has thus led me to infer that the remedial sphere of hydrastis is confined to the arrest and removal of *scirrhus* in its early stage, and chiefly when its situation is in a gland or in the immediate vicinity of a gland." Dr. Ruddock testifies to its undoubted usefulness "when the cancer involves the glands or the uterus."

Phytolacca decandra.—This remedy has been brought prominently before the profession by Dr. Hale,* who has "found it fully equal to our best anti-psorics in the treatment of old ulcers, even

*Hale's New Remedies—Phytolocca Decandra, p. 771.

of a syphilitic nature;" and he claims it to be a congener of *silicea, lachesis, arsenicum, kali bichrom.* and *sulphur*. *Phytolaccin* has been much employed in the treatment of carcinomatous affections, and its beneficial effects are most apparent in cases of open cancer. It has been found quite effectual in lupus, applied either in the form of a paste with water, or in strong alcoholic tinctnre when used in the early stages. An inspissated juice of the leaves, or the dry phytolaccin has been recommended in indolent ulcers and as a remedy in cancer."

" *Carbo animal.*—This appears to be especially suited to those cases in which the ulcerative process is indolent, while the vital powers are greatly depressed. In the case of a lady suffering from cancer of the womb, in whom this condition existed, and who was under our care for several months preceding her death, great constitutional benefit was derived from this medicine administered in the third trituration. She rallied from a condition of almost death-like torpor, and we have no doubt that from its use some months were added to her life."

Arsenicum.—On the other hand though not so closely identifying itself with the earlier physical signs of the disease, is so strikingly pointed at by the cachexy which prevails in the advanced stages, that we are ready to anticipate for this remedy even a greater value than experience unfortunately proves it to possess, when given in crude doses. Nevertheless, we do attach great importance to it; but our opinion leads us to administer it in the medium potencies to ensure the full benefit of the remedy. In the *earlier* stages something may be done to correct the dynamic condition upon which the predisposition to the disease depends, and then given in the higher potencies we have found the most brilliant results; but as a means of combatting the cancerous blood poison, we believe that the medium and even lower potencies effect the most benefit. *Dr. Ruddock remarks: " We can testify to the priceless worth of this remedy in different dilutions, perseveringly administered; it has arrested the growth and gradually dispersed cancerous enlargements. * * * The value of the drug being " often expressed by the restoration and maintenance of the patient's general health.'" Hel-

* Text-Book of Medical and Surgical Principles.

muth says that the cases which in his experience have longest resisted the disease, were invariably those in which medical treatment was persevered with, and in which the chief remedy was *Ars. alb.* The power of *Arsenic*, as a prophylactic after operation, is highly lauded by Alter and others.

Conium.—"The specific relationship of this remedy, homœopathically considered, to old indurations," say Drs. Marston and Maclimont, "especially when resulting from a blow, and still more when occurring in old people, will fully account for the fact of its having removed such indurations bearing a close resemblance to scirrhus tumors, and greatly relieving truly cancerous growths. I have had many opportunities of administering this remedy in various potencies to patients suffering with cancer, attended with very severe pains, and have uniformly found relief result; and this result has been gained quite as readily with the medium potencies as with material doses. Dr. Ruddock states that it is chiefly beneficial in cancer of the breast, and a lotion of the remedy is very soothing to the pain in open cancers. Dr. Hughes says that *Conium* "which acts so powerfully upon the breast has not unfrequently arrested the progress of mammary scirrhus."

Carbo. an.—This remedy appears to be especially suited to those cases in which the ulcerative process seems indolent, with great depression of the vital powers. In the case of a lady suffering from cancer of the womb, in whom the above condition existed, I found great relief from the use of this medicine in the medium potencies, and in an attack of extreme and almost fatal depression, she rallied, and I have no doubt that from its use, several months were added to her life. The ground of its virtues, says Hughes, is the same as that of *Hydrast*, which, from its specific action upon the glands, "enables these active eliminants to cast out the morbid matter in its early stage." Raue recommends it in scirrhus tumors that are hard and uneven, the skin loose with a bluish-red appearance, with burning pains and drawing upwards to the axilla, oppression of the chest, with despondency.

Galium aperin.—This remedy has enjoyed quite a reputation in the cure of a hard, firm, circumscribed tumor, nodulated and uneven, and presenting the appearance and feel of a scirrhus

formation. The galium was administered in watery extract, two ounces of the extract having been dissolved in a half pint of water, of which the patient took one and a half drams twice a day in a wine-glass full of water. The mixture was also applied warm to the tongue in which the tumor was imbedded, several times a day, retaining it a few minutes during each application. In one month she completely recovered, all the evidences of cancer passed away, the pain diminished and the tongue returned to its normal size and condition. I have used this remedy very much in my practice and have found great good to result from both its internal and local administration. In a very severe case of carcinoma of the uterus I certainly prolonged the life of the patient several months and palliated all the more painful conditions. Drs. Winn and Ogle contend that "it has the power of correcting the peculiar dyscrasia of the blood." It favors the production of healthy granulations and modifies to say the least the cancerous cachexy of the system.

Epitome of treatment.—Hydrast. can. cured a case of encephaloid of the eye. Reported by Dr. Hartung.

Kali hydrocyanate in 1-100 of a grain, a dose repeated every fourth day cured a cancerous ulcer. Reported by Dr. Hughes.

Bell., etc.—A most interesting case of fungus hæmatodes oculi was completely cured by *Lyc.*, *Sepia.* and *Sil.* Reported by Stapf.

Bell., *Nux.*, *Euphras.* and *Ac.* completed the cure of a similar case to the one above, in four weeks. Reported by Muhlenbein.

Bell., *Bry.*, *Phos.*, *Hepar.* and *Ars.*, given according to the indications, cured a case of encephaloid of the breast after several months medication. Reported by Dr. Von Victernghoff.

Aurum. has proved of great value in cancerous affections of the bones, especially those of the face.

Kali brom. in cancer of the brain or when the nerves have become implicated so far as to produce convulsions.

Hydrocotyle a. has been of special benefit in uterine cancers.

Sanguinaria c.—Dr. Craig extols this remedy highly for its beneficial effects in preventing the return of the disease after excision. It has been employed locally in the escharotic treatment.

Carbolic ac. has cured hæmatoid cancer on the right cheek. It is of great value in ridding the system of the cancerous poison after operation. Drs. Pease, J. C. Morgan and Beebe, highly laud its curative action.

Chimaphila umb.—A cure of ulcerated scirrhus is reported as having been cured with this remedy by Dr. E. S. Coburn.

Cedron has been used successfully as palliative to the severe suffering and lancinating pains in the advanced stages of cancer. Dr. E. M. Kellogg, of New York, testifies to its efficiency. He gave it in drop doses of tincture, frequently repeated.

Lapis. alb.—This remedy, introduced to the profession by Dr. Grauvogl, is highly recommended by him in the treatment of all affections of the glands and lymphatics, unbroken carcinoma, and in all scrofulous affections, sores and abscesses. He reports five cases of uterine carcinoma cured by it. As a condition of its great value in these diseases, he remarks: "An indispensible condition of success in these forms of disease, consists in that they develop in constitutions that thave not suffered previously from intermittents or other malarious affections, as otherwise *Lapis albus* not only aggravates everything but even engenders relapses of intermittents and other malarious affections." He adds: "I have not yet seen a cancer apertus cured by this remedy."

Magnesia mur. has removed scirrhus induration of the uterus.

Phosph. has effected good results in excessively painful and hard indurations in mammæ, unaccompanied by inflammation. It has also proved beneficial in Fungus hæmatodes in the thigh, painful and accompanied with continued discharges of venous blood.

Arsenic iod.—This remedy has been only *partially* proved, and from the symptoms it has caused and from the clinical results which have been obtained by its use, is shown to be a remedy of great curative power in cancer.

Ferrum phos.—Prof. Helmuth recommends the employment of this remedy in open cancer; he says it has produced "the most happy results;" by its adminstration the pain is lessened and the ulcer takes on a more healthy appearance.

Calc. oxal. has relieved the terrible pains in open cancers.

Lach. in scirrhus mammæ when the pains were lancinating

and produced by pressure, with a constant painful feeling and lameness in left shoulder and arm, aggravated by use. In open cancer, of dark bluish-red appearance, with dark streaks of coagulated and decomposed blood.

The following remedies may be compared: *Apis.*, *Asterias rub.*, *Badiaga.*, *Clem.*, *Crot.*, *Graph.*, *Lyc.*, *Aurum.*, *Kreas.*, *Nat. c.*, *Sil.*, *Sepia.*, *Thuja.* and *Sulph.*

PART III.

INJURIES AND DISEASES OF NERVES, VEINS AND BONES.

CHAPTER I.

WOUNDS AND DISEASES OF NERVES.

Wounds of Nerves.—*Complete* division of a nerve produces paralysis and loss of sensibility in the parts to which it is distributed, which, however, are regained as soon as the nerve unites; this union may occur in a greater or less time, according to the conditions surrounding the division. "Sometimes, however, the divided ends instead of uniting, shrink and become bulbous, as they do in a stump after amputation."

Partial division of a nerve by cuts, stabs, or in the performance of an operation, leaving some fibres on the stretch, produces very unpleasant results, such as severe pain in the part, recurring in paroxysms and shooting along the course of the nerve; violent spasms, or paralysis of the limb; epileptic convulsions and disorders of digestion. If the nerve is merely *pricked*, the symptoms are less severe than when it is partially divided; there is sharp and darting pains in the part affected, with tingling and numbness below the part injured. If a nerve has been bruised, compressed or stretched, or if it has been divided and its extremity has become squeezed in a cicatrix, nearly the same symptoms will occur as when it is partially divided. This condition of the nerve sometimes follows amputation, and with it there is

excruciating pain, spasms, and retraction of the muscles of the stump, causing a conical shape. Sometime after the division of a nerve and the severed ends being separated, the cut extremities connect by a neuroma or button-like tumor, causing intolerable pain and great suffering, for which a redivision has been advised, or indeed an amputation may be the only means of permanent relief.

Concussion of Nerves.—Prof. Willard Parker, of New York, describes a peculiar kind of nervous disorder which he terms "concussion of the nerves," following severe injuries, railroad and other accidents. The first symptoms after the injury is paralysis with little or no pain supervening; the patient is left in a weak and miserable condition of health for a long time thereafter.

Treatment.—If these symptoms come on *immediately* after a wound, so that it is probably caused by the partial division of a nerve, an incision should be made down to the nerve and complete its division. If they come on during the cicatrization of a wound, the cicatrix should be dissected out and the parts be permitted to heal anew. It sometimes happens, however, that these symptoms are not removed even when an operation has been performed as previously advised. It becomes necessary, thereupon, to select a suitable remedy which will in a large majority of cases effect the desired relief. Among the remedies of value in this troublesome condition, the following seem the best indicated; *Acon.*, *Bell.*, *Hyper.*, *Coloc.*, *Allium cepa.*, *Ignatia*, *Nux vom.*, *Moschus.*, *Camph.*, *Verat. alb.*, *Calab. bean*, *Secale.*, *Coccul.*, *Hyos.*, and *Zinc*, *Aranea di.*, *Lach.*, *Spigel.*, *Caust.* and *Clem.*

Epitome of treatment.—*Aconite.*—When the pains are severe, recur in paroxysms, are worse at night.

Bellad. for acute, throbbing intermittent pains and in plethoric persons.

Colocynth. for severe paroxysms of cutting pains, with sudden, violent lancinations extending a considerable distance from the part injured.

Ignatia for pains and numbness, with tendency to spasmodic jerkings; worse at night so as to prevent sleep, with sinking at the pit of the stomach; spinal irritation rather than cerebral;

hyperæsthesia; restlessness, followed by chilliness; emotional sensitiveness; spasms and twitchings.

Spigelia for jerking and tearing pains aggravated by movement.

Nux vom.—Numbness and tingling in the parts with tendency to paralysis; violent pains in the back with gastric derangement.

Moschus. for a sensation of coldness along the spine; excessive nervousness; a feeling of numbness of the injured parts; paralysis threatening.

Camph. for great concussion of the nerves with threatening tetanus; symptoms of shock and coldness prostration and anxiety, followed by vomiting, purging and cramps.

Verat alb. when after injury the pains are maddening, attended with cold sweat, constriction of the larnyx, and stiffness of the parts with tremblings.

Hyos., Sec,, Coccul., Calab. bean Tabacum and *Zinc* may be employed when their indications are called for.

Electricity.—Good results accompany the Faradic or voltaic current. Both electrodes should be firmly and continuously pressed upon the skin, one over the origin of the nerve, the other over the focus of the pain so as to include the circuit of the affected nerves. I have used this agent with decided benefit in such cases.

***Nerve Stretching.**—"This new and peculiar method of treating certain affections of the nervous system, as tetanus, neuralgia, epilepsy, was introduced to the profession in 1872. Since then many experiments have been made, some of them being remarkably successful. Dr. Paul Vogt, Professor of Surgery in the University of Griesswald, has written a systematic treatise upon the subject, in which he gives the experiences of Billroth, Von Nussbaum, Palmbau, Peterson and himself. These surgeons performed the varied operations for different nerve diseases. Thus, Billroth laid bare and stretched the sciatic for spasm of the leg. Von Nussbaum, for intense neuralgia, with spasmodic contraction and loss of sensation in the muscles of the arm, exposed and stretched the brachial plexus. Others have cured paralysis, reflex epilepsy, neuralgia and traumatic tetanus. In the last named disease the brachial plexus was stretched, the injury

*Helmuth's System of Surgery, p. 403.

being at the hand, in one instance; in another, the tibial was exposed and stretched, the injury being at the foot. In both cases a cure was effected."

In summing up the evidence of results following this novel and peculiar method, Callender writes:

"I hope this note may lead to a further trial of this method of treatment. The operation is not a severe one. The nerve is exposed and stretched, when freed from its surroundings, by traction with an ordinary vulsellum, from its central connections. No harm is likely to be sustained as a consequence. There is now abundant evidence in the cases reported by Billroth, Nussbaum and myself, of the tolerance with which nerves submit to forcible stretching, so far as the after performance of their functions is concerned. In view of the unsatisfactory results of the treatment of traumatic tetanus, as at present conducted, there is full justification for the performance of the operation, as, at least, a last resource, although I should myself advocate its trial, as in the case under the care of M. Verneuil, as soon as the signs of the disease are distinctly recognized."

The operation is described as follows: "The actual accomplishment of such an operation appears very simple, and yet from a study of all the published details, it is clear that final success depends very much on attention to small matters which sometimes are apt to be forgotten. The operation may be divided into three stages: 1st. Laying bare the nerve within its sheath. 2d. Drawing forwards and stretching the nerve. 3d. Reposition and application of dressings. The first act of the operation is a very important one. In the case of traumatic tetanus, before reported, some important changes were found, not only in the nerve itself, but in the surroundings of its sheath. In all such cases it *is recommended to free the nerve sheath on all sides* as far as one can reach; stitching then accomplishes the rest. The second act of the operation may be performed either manually or instrumentally. For the drawing forward of the nerve one naturally uses a blunt hook, or an elevator, or for a small nerve an ordinary aneurism needle. The actual stretching is best accomplished by passing the forefinger beneath the nerve. By this means we can secure as much force as is necessary, provided the

limb is placed in a suitable position. The use of the finger is better than a hook, as there is no danger of injuring locally the nerve itself. In the case of small nerves, a thin elastic band may be substituted. In this way an *elastic* traction can be used without the risk of locally injuring the nerve. The last part of the operation is the dressing. If the stretched nerve does not recede when the limb is placed in its normal position, the operator must gently tuck the nerve into its bed, then place a small bit of drainage tube in at the bottom of the wound and close by sutures. Lister's dressing and spray is recommended in the cases, as rapid union and a small scar must be tried for." Prof. Helmuth has successfully stretched the sciatic five times for Sciatica and reflex convulsions; the ulna once, and the inferior dental once.

Tooth wounds.—Wounds inflicted by the bite of man or the inferior animals, are always matters of grave import, though the man or animal be not mad. The bite of man is always poisonous, and the wounds made are most troublesome to heal, and oftentimes require amputation as a last resort when situated on the fingers. Death has resulted from bites of the nose and ear, when done by temporarily "rabid" human beings.

Treatment.—First thoroughly cleanse the parts bitten and apply a solution of *Carbolic acid.* When symptoms of erysipelas set in, *Ac.*, *Apis.*, *Bell.*, *Canth.*, *Lach.*, *Crotalus*, *Ars.*, and *Rhus.* are the principal remedies to be employed. *Carbonate of Potash* solutions relieves the pain in the part. If formation of pus threatens, *Hepar.* and *Merc.* are valuable. Evacuate abscesses whenever they form, and treat on the general principle of poisoned wounds.

CHAPTER II

TETANUS.

Tetanus is a nervous disorder, characterized by painful and continued contraction of the muscles, following an injury. It often supervenes on punctured lacerated, and other wounds implica-

ting nerves and fasciæ. When arising from injury, it is known as Traumatic Tetanus. When dependent on constitutional disturbance, it is called Idiopathic.

Tetanus is often developed from verv slight causes: from laceration of a small nervous branch; from puncture, as with a fork or nail, or from a bruise; but is more likely to follow lacerated and punctured wounds than those which are clean-cut, still it may occur as a result of surgical operations, however skillfully performed. It is especially apt to occur in feeble and debilitated constitutions, and hence may result from any cause having a tendency to impair the vigor of the nervous system. Wounds of the hands and feet are apt to give rise to it.

There are several varieties of this affection; when the spasm attacks the muscles about the neck, face, and jaw, it receives the name of Trismus or Lockjaw; if the patient is bent backward by contraction of the spinal muscles and the flexors of the lower extremities, it is called Opisthotonos; when the body is bent forward, Emprosthotonos; and when sidewise, Pleurosthotonos.

Symptoms.—The symptoms first observed are an uneasiness and stiffness in the muscles abont the temples, jaw, and neck, the patient being unable to open his mouth widely. This is succeeded by a peculiar expression of countenance; the features are fixed or convulsed, giving the countenance an aspect of pain and anguish, *risus sardonicus.* The spasms are never noticed in the parts injured. The involuntary muscles next become affected, producing difficulty of breathing, with spasmodic pain in the region of the diaphragm and stomach; the abdomen becomes violently contracted and knotty, which is succeeded by constipation and retention of urine. The intellectual faculties remain undisturbed; the pulse natural or slightly increased in frequency, which is due to muscular contractions rather than any febrile action. The symptoms become more and more violent as the disease continues, death resulting from exhaustion, consequent on the frequency of the tetanic spasms, in from two to fourteen days.

The only affections likely to be confounded with tetanus are hydrophobia and myelitis. The spasms peculiar to tetanus are continuous, in hydrophobia they are intermittent, and confined to the region of the throat; in tetanus, also, the mind remains

clear, while hydrophobia is attended by more or less delirium.

In myelitis there is high febrile reaction, with a continuous, burning pain in the back, often accompanied by paraplegia—conditions which are not met with in tetanus.

Treatment.—To remove, so far as possible, any or all causes operating in inducing the disease, or which may continue to keep up a source of irritation after it has been developed. The causes may be the presence of irritating spiculæ of bone, of rust, dirt, or any foreign matters in contact with the nerves and tendons. It is true that when once tetanic excitement has been set up in the spinal cord, it has a tendency to continue, and can not be removed by mere abstraction or cessation of the local irritation that gave rise to it in the first instance. Treatment will succeed best after all local irritation has been removed; for so long as this continues to keep up the centric nervous disturbance, no general means can be expected to succeed, as they will not only have to combat already existing diseases, but also to overcome the continuous excitement maintained by the local disturbance. The *division of an injured nerve* that has been punctured or lacerated has occasionally proved successful. When there is reason to suspect a foreign body in a cicatrized wound, after tetanic symptoms have set in, it is best to cut down upon and extract, if possible, the offending material. In a case of tetanus following injury of the supra-orbital nerve, Larrey divided it entirely, and cured his patient. In another case following a punctured wound caused by a rusty nail entering the sole of the foot, a complete cure was made be dividing the posterior tibial nerve. In those cases in which no special nerve appears to have been injured, Liston recommends making a V-shaped incision down to the bone and above the part, insulating it completely. *Amputation* of the wounded portion has been performed with an occasional good result; still it is to be hoped that few surgeons can be found who are so utterly devoid of all surgical judgment, not to say human sympathy and feeling, as to remove a leg or an arm on the approach of tetanus, and certainly none after the disease has been fully established.

*Hypodermic Injections.**—"Among the recent suggestions for

*Smith's Surgery, vol. i, p. 478.

the relief of tetanus is that of Pescheux, who injects ten or twelve drops of a solution of atropia into the areolar tissue of the neck, near its median line; the symptoms of atropia poisoning soon became well marked. When these subsided, the tetanic symptoms had almost disappeared, deglutition becoming easy, and the muscular rigidity much lessened. A second injection in the evening dissipated what remained of the tetanic symptoms."

In a case which came under the observation of Prof. Helmuth, the calabar bean was used hypodermically with amelioration of the spasms of the muscles of deglutition. Eight drops of the following mixture were used every three hours: ℞. Alcoholic extract calabar bean, (English) grs. vii. Alcohol dilute ʒi. M. M. Demarquay reports two cases of traumatic tetanus treated by intra-muscular injections of morphine.

Ice.—Dr. Carpenter, of New York, reports two cases of traumatic tetanus successfully treated by the application of *ice* to the head and the whole length of the spinal column. The ice was applied from ten to thirty minutes each time, with intervals of from two to eight hours, followed by immediate relief, the spasms disappearing in twenty minutes from application.

Chloroform.—Dr. Henkle, of Lancaster County, Pa., reports a case of tetanus cured by the application of chloroform along the spine and to the epigastrium, renewing the application every hour or two, according to the urgency of the symptoms.

In the *constitutional treatment* of the disease, the remedies best adapted to meet the various indications as they are presented in the disease, are: *Acon.*, *Angust.*, *Arn.*, *Acid hyd.*, *Ars.*, *Bell.*, *Camph.*, *Cic. vir.*, *Curare.*, *Con. mac.*, *Cup. met.*, *Hyos.*, *Ignat.*, *Ipec.*, *Kali brom.*, *Lach.*, *Nux vom.*, *Opium*, *Rhus tox.*, *Secale cor.*, *Stram.*, *Verat.*

Special Indications.—Aconite.—When there is frequent alternation of redness and paleness of the face and distortion of the eyes; also in opisthotonos, when the upper and lower limbs are drawn in, the hand and thumb being clinched, the eyes drawn upward, and the face covered with a cold sweat; hot and dry skin over the body; full, strong pulse, with twichings in the thighs, rigidity of the muscles of the neck and jaws.

Arnica is useful in cases of tetanus arising from wounds, though it has proved most beneficial where it has been employed after the use of some other medicine. It should also be applied to the wounded surface externally, as well as administered internally; or it may be given from the first when there are short, panting breathing, jerks and shocks as if produced by electricity, tremor of the limbs, etc.

Acid hydrocyanic.—With lock-jaw, bloating of the face and neck, protrusion and glistening of the eyes, immobility and dilatation of the pupils, bluish-red color of the face, frequent pulse, rigidity of the limbs, the trunk being bent either forward or backward, the convulsions depending upon a congested state of the cerebral vessels.

Belladonna.—When the convulsions are partial; shivering and trembling of the

limbs; spasmodic, constrictive sensations in the epigastrium, accompanied with shortness of breath; anxious and distressing feeling in the chest; drawing and stiffness in the neck and spine; spasmodic contractions in the tongue; vertigo and yawning; painful stiffness of the muscles of mastication; contortion of the eyes; paroxysms of stiffness and immobility of the limbs, aggravated by the least contact; insensibility and rattling breathing; spasmodic inclination of the head and body to the left side; paroxysms of rigidity and immobility of all the limbs or of a single limb, sometimes accompanied with insensibility, distension of the cutaneous veins, red and puffed face, full and quick pulse, and profuse sweat; trismus, with painful constriction and narrowing of the fauces; oppression of the chest; labored, irregular breathing; delirium and stupor.

Camphor may be used for tetanic spasms; loss of consciousness; limbs fixed and extended; head drawn to one side; lower jaw rigid and gaping; lips drawn inward; unceasing distortion of the muscles of the face; coldness over the whole body; oppressed, anxious, panting breathing.

Cicuta virosa.—In *trismus*, when there is accompanying tetanic rigidity; in opisthotonos, as well as emprosthotonos, where there is leaden paleness of the face, with coldness, grinding of the teeth, foaming at the mouth, and inability to swallow; tetanic spasms of the cervical muscles; cramps and stiffness of the whole body, or with curvature of the limbs that cannot be straightened. In the convulsions to which strychnine is homœopathic, consciousness is preserved to the last, whereas, the absence of consciousness is characteristic of the cicuta convulsions. It affects the upper portion of the cord, and has proved most serviceable in those cases which have originated from immediate irritation of the brain, from injuries or other derangement of the cerebral substance.

Hyoscyamus.—In convulsions of the upper and lower extremities, with contraction of the extremities and tossing of the body upward; the eyes are staring and distorted, with spasmodic closure of lids, bluish face, clenching of the teeth; foaming at the mouth, constriction of the throat, drawing of the neck to one side, with rigidity of the hands, contortions and spasmodic curvings of the body. The symptoms show that the cerebro-spinal axis is disturbed to its very center.

Nux vomica is indicated in tetanic convulsions, with violent concussion and violent spasms of the whole body; extreme rigidity of the limbs; tetanic convulsions, with frequent and fluttering pulse during the attack, and general sweat; frightful spasms of the whole body, with opisthotonos, distorted eyes, drawing in of the muscles of the chest; spasms in muscles of mastication; opisthotonos with feeble beating of the heart, pulse small and scarcely perceptible; spasms preceded by violent chills and shudderings, with formications, and painful sensations resembling the passage of electric sparks. Consciousness does not seem to be affected. In idiopathic tetanus where the spasm has its origin or takes its starting-point from the spinal cord. In persons who have been addicted to the use of stimulants.

Opium.—In twitchings of the facial muscles, distortion of the mouth, trismus, with irregular, difficult respiration, spasmodic trembling of the limbs, with foaming at the mouth, flushing of the face, unsteadiness of the eyes, quivering of the lips and facial muscles.

Stramonium is more especially called for in attacks of paralysis *succeeding* convulsions, when disturbances of the special senses and of the intellectual functions are present, or in those cases where paralysis and convulsions co-exist. *Hydrophobic convulsions* have been successfully treated with this remedy.

Some of the preceding remedies may be required during the treatment of the case, if long continued, and should be given according to the indications demanding their use.

Curare was introduced to the profession as a remedy for tetanus by Mr. Lloyd, of St. Barthlomew's Hospital, with considerable good results. Ghesini* cured a case of traumatic tetanus by subcutaneous injection of curare—as much as forty-seven grains were injected in sixty single and thirty-two double and treble injections. The treatment was commenced on the fifth day, and the patient was convalescent on the seventeenth day.

***Chloral hyd.**—This remedy has produced better and more satisfactory results than any other single remedy heretofore employed. Prof. Helmuth regards it as "a most valuable medicine," and reports a severe case of trismus and opisthotonos mainly cured by its use. He gave the hydrate in ten-grain doses. It may also be employed hypodermically in five-grain doses.

Dr. Chapin, in the monthly abstract of Medical Science, presents a review of eighty cases of tetanus, and "concludes that chloral, administered by enema or draught, offers the best hope of saving the patient's life. Enemata are made by adding the solution of chloral to milk, into which the yolk of an egg has been stirred."

Nerve Stretching.†—"Dr. Paul Vogt cured a case of traumatic tetanus supervening an injury to the right hand, completely and immediately by exposing the plexus at the anterior border of the trapezi .s, and vigorously pulling the nerves centripetally and centrifugally, and freely dividing nerve sheaths

* British Journal of Homœopathy, vol. xxi, p. 451.

† Helmuth's System of Surgery.

which were red." Prof. Helmuth has made this novel and brilliant operation several times of late, and in each case with the most beneficial results.

Warm baths are highly advocated in the treatment of this affection. The most unequivocal advantage follows general bathing and a thorough application of fomentations to the affected parts and to the spine.

After recovery begins to take place, the greatest care must be observed during convalescence lest a relapse occur and destroy the patient when he is apparently upon the very threshold of returning health. The clothing should be warm; the diet light but nutritious; the secretions preserved in as normal a condition as possible, and all exposures to atmospheric vicissitudes sedulously avoided.

CHAPTER III.

INJURIES AND DISEASES OF VEINS.

The changes and manifestations that take place within the veins and in certain cases where the lesion involves the arteries and veins conjointly, are matters of interest to the surgeon. The old term phlebitis has yielded to the modern appellation of *Thrombosis*, which Virchow describes as an "affection essentially consisting of a real coagulation of blood at a fixed point." The two terms, *thrombosis* and *embolism*, have been very largely misunderstood by the profession because of the confusion that previously surrounded them. Under the term thrombosis, therefore, I shall include the *coagulation of blood within the veins*, and *embolism the formation of clots within the arteries.*

Thrombosis is a local coagulation of blood with the formation of blood clots following an injury of a vein during the process of repair, or when the venous blood flow undergoes deterioration in its vital force, the circulation becoming languid and weak through unhygienic surroundings, errors in diet, the press-

ure of tumors and defective alimentation and nutrition. The clot may be carried along the channel of circulation and attaching itself at some weak spot in the wall of the vessel, disease of the vein may be caused nearer the cardiac centre; or it may insinuate itself in the opposite direction against the venous stream and becoming lodged at a point of bifurcation, may set up a genuine phlebitis. In a short time the clot becomes adherent to the vein wall and by the fibrinous deposits thrown out, it either finally occludes the vein entirely, or the fibrin extends along the continuous surface of the vein wall and permits the venous flow between the clot and the vein wall, just as surface strictures of the urethra are formed by the organization of plastic lymph upon the surface of the mucous urethral tissue.

When thrombosis increases to such an extent as to arrest the venous flow entirely, obliteration of the vein takes place followed by œdema, paleness of the surface, etc., when to this condition there are a *congeres* of veins affected with a state of inflammation superadded, there is said to be white swelling or milk leg, which softening and degenerating under the inflammatory process, a *puriform* condition is generated.

When thrombosis affects a limb, the symptoms at first are not very severe; the face becomes hot and flushed, the skin is dry and pungent with considerable stiffness; the veins on the surface are felt hard and corded, and the phenomena of inflammation are present to a greater or less degree. If, in connection with these symptoms, an injury or bruise has been inflicted, the diagnosis is simplified. The prognosis of thrombosis depends upon the size of the vein affected and the magnitude of the clot; nutrition will be effected accordingly as the circulation is interfered with; if a portion of the clot is washed away into the general circulation from time to time, symptoms of pyæmia will be developed.

Treatment.—Acon. in the first stage of the disease, with an increase of the disease, and threatening suppuration, *Hepar. sul.*, *Merc.*, *Cham.*, *Lyc.*, *Ham.*, *Lach.*, *Puls.*, *Phos.*, *Rhus rad.*, and *Sulph.*, are remedies of the first importance.

Varicose aneurism is a false or traumatic circumscribed aneurism associated with a varicose vein. Its symptoms are not unlike those of an aneurismal varix; in most cases the existence

of two distinct tumors can be recognized; the one superficial, fusiform and discolored, and hypertrophied, continuous with the venous trunk and emitting a vibratory sound; the other lying deeper, more clearly circumscribed, the walls becoming thicker as the tumor increases in size, and which yields a peculiar blowing or bellows sound (bruit de soufflet).

Treatment.—The same as recommended for aneurism, etc., vol. ii, p. 191.

Lesions of Veins like wounds of other structures are divided into the incised, lacerated and contused, punctured, transverse and longitudinal. The walls of veins being much thinner, their situation being more superficial and exposed than arteries, are more liable to injury than the latter.

The flow of blood from a vein may be easily distinguished from that of the artery, first, by the anatomy of the parts, the darker color of the blood, the continuous stream and by the actual inspection of the bleeding vessel if it be superficial. In injuries to the deeper seated vessels producing rupture of their coats with hemorrhage, it is a matter of some difficulty to determine the source of the blood flow. The small arterial twigs that have been divided by the course of the instrument toward the injured vein mingling with the venous flow will render it brighter colored. It must also be remembered that anæsthesia long continued changes the color of arterial blood, so that in many cases it can scarcely be distinguished by its color from venous hemorrhage. The blood flow from the distal end of a divided artery is considerably darker than the current which flows from the proximal end. As a rule, however, the source of the blood flow can be easily determined; in cases of doubt, compression of the main arterial trunk of the bleeding vessel at the cardiac side of the wound will furnish a sure diagnosis. If hemorrhage is controlled by the pressure, the source of the blood flow is from an artery; if it is increased the hemorrhage is venous. In amputation, especially in the region of the thigh and arm, it is not an unusual matter for the blood flow to continue after all the principal vessels are tied, sometimes, even, to an alarming extent from the cardiac ends of the divided veins; this hemorrhage immediately ceases after the removal of the tourniquet.

Veins when divided transversely, are closed by the contraction of their divided extremities, and by the formation of clots and subsequent cicatrization of their cut walls, in very much the same manner as occurs in arteries; but it has been observed that the contraction of the divided extremities of veins is much less complete than those of the arteries, and that the method of clot formation in veins is also less regular than in the case of arteries, though their complete occlusion and final cicatrization is more speedily accomplished than in arterial branches. In injuries affecting the smaller trunks, the closure may be somewhat hastened by elevating the limb, by application of cold water or by the various styptics or artificial hæmostatics, recommended on page 42.

An impression has long existed, which I believe has no foundation in fact, that the closure of a wounded vein by ligature is exceedingly prone to be followed by phlebitis. My own opinion is certainly averse to such a conclusion, and I am sure that during an extensive army practice, as well as that in civil life, I have tied scores of venous trunks, including some of the largest calibre without any serious results following, and I hold the principle to be erroneous in theory and not borne out by practice.

A punctured wound involving less than one-third of the circumference of a vein, may be safely occluded by a ligature, without tying the whole vessel.

Treatment.—For special indications of remedies and the various hæmostatics that are recommended in hemorrhage consult the chapter on Injuries and Diseases of Arteries, page 39.

Hemorrhagic Diathesis.—The fact that some persons are more prone to hemorrhage than others is a matter of almost daily observation to the busy surgeon; this is due to hereditary influence, mercurialism or to a peculiar impressment of the system acquired by erroneous hygienic and dietetic influences. The systemic condition is similar to scurvy in many of its symptoms, the blood being thin and defibrinated, and the hemorrhage taking place from the most trivial cause. I have frequently pointed out this constitutional defect in patients before operative procedure, and if we investigate closely the history of these patients as to the loss of blood produced by the most simple scratches or in

juries, we shall be led into the very channel of information that unfolds this internal defect and which to the surgeon is so valuable to know *before* an operation of any great magnitude is undertaken. I agree with Prof. Helmuth and others, that a constitutional diathesis exists in all such patients, and that as a consequence there is weakness of the capillary vessels, with a loss of contractile power, caused, it may be, by a diminished quantity of plastic materials in the blood, but how to determine the fact before submitting the patient to operative procedures is a question yet to be determined. I have demonstrated in *four* well-marked cases of mercurial cachexy that this hemorrhagic diathesis existed, and foretold the effect of operation which occurred just as predicted. I well remember an operation upon a mercurio-syphilitic patient (a drover), upon whom I operated for necrosis of the femur, where the blood flow was so alarming before and after the removal of the tourniquet, that I feared the worst results, although I employed the best hæemostatics known to surgery. The stream was continuous, dark-colored, and seemed to well up from every muscular and connective fibre divided, and it was sometime before I finally succeeded in checking it. There was not a single vessel divided larger than a knitting needle, yet on the seventh day the hemorrhage returned, and fearing the effect would be serious, a consultation was held and amputation in the upper third of the thigh was performed. The blood flow was alarming, although I used Esmarch's roller, and on the eleventh day secondary hemorrhage again took place from the femoral artery, which necessitated its ligation two inches above its previous division. With all the care and attention I gave this patient it was with the utmost difficulty that I saved his life. Five months after the first operation, he finally left the hospital cured, his system even then not rallying to the point I had hoped for.

Three other cases, where the operations were of lesser magnitude, the same hemorrhagic diathesis existed, and in each case unmistakable evidences of mercurialism existed. I have a lady under my charge at present, making the fifth case, where the same hemorrhagic diathesis exists, and attributed to the same cause. No operation being demanded in the latter patient, I

am not permitted to verify my conclusion in this case, viz.: that mercurial cachexy predisposes to hemorrhage. In the other cases the diathesis and the predisposition to bleeding from the most trifling causes, support the principle I have observed and which I believe to be correct.

Treatment.—In all the cases mentioned I have succeeded largely in overcoming the broken down forces and establishing a more perfect and more uniform health by the use of the following remedies, viz.: *Nitric acid, Kali jod., Phytol., Iodium, Ars., Phos., Ferrum., Corydal., Calc. phos., Sec., Silic.*, and *Sulph.* The remedies should be selected not only with a view to systemic impairment, but it should include such abnormal manifestations as are most frequent and important.

Entrance of Air into Veins.—This is one of the dreaded results that threaten in those major operations, especially about the neck and upper part of the chest. Few surgeons of large practice have escaped this accident. The local signs which indicate the admission of air into large veins are a sucking, purling and piping sound, with bubbles of air escaping from the wound: a peculiar gurgling sound, resembling, as Prof. Hamilton describes it, "the sound produced by pouring water from a bottle," occurred in his own case; his patient did not die.

The constitutional effects are a tumultous and heaving action of the heart, with great prostration; the respirations are embarrassed; the countenance is expressive of great anxiety and fear, and the movements of the heart become suddenly feeble and almost imperceptible. "The hand placed over the heart," says Gant, "perceives a peculiar bubbling, thrilling, rasping sensation, produced by the air and blood being whipped together within the ventricle." Mr. Hamilton says that "under the ear there may be observed also, sometimes, a churning noise synchronous with the ventricular systole." If there is only a small quantity of air admitted, the patient may recover, but if the quantity is considerable, a condition resembling syncope is produced and the patient dies during a convulsive struggle.

Great care should be exercised in all important operations in the neck and subclavain regions, and an assistant should guard well these doors of death when opened during operative proced-

ure, by keeping up uniform pressure upon the cardiac side of the wound.

Phlebitis.—The inflammation to which veins are liable is either of the *circumscribed* or *diffuse* variety. Contusions, lacerations, incisions, and punctures are the most frequent causes of the disease. All injuries and lesions of the vein walls are liable to be followed by inflammation (traumatic).

Phlebitis may also occur as an idiopathic affection, as from exposure to cold, sequelæ of fevers, or a condition of varicose, and usually occurs in the lower extremities.

In the circumscribed variety, the inflammation may be either of the adhesive or of the suppurative kind. When diffuse it partakes of an erysipelatous character. Phlebitis may occur idiopathically or may be the consequence of injuries in those who are of impaired health. Externally the veins appear red and swollen. Lymph is effused on the internal vein wall and the blood participates in the morbid process by becoming coagulated, which results in the final plugging up of the venous trunk. In this case adhesion takes place and the inflammation begins to subside, by this process of repair. Sometimes it terminates in suppuration; the lymph and coagulum form a boundary wall, thus preventing the pus from entering into the current of circulation. Phlegmasia dolens, (milk leg) peculiar to nursing women, is an inflammation similar to phlebitis. When the inflammation is of the diffuse or erysipelatous variety, this boundary wall is not formed on account of the unhealthy and poisonous character of the exudation, and purulent infection is the result, with an adynamic state of the system, low, typhoid fever, a brown and dry tongue, fluttering pulse, loss of appetite, nausea and diarrhœa, all the symptoms resembling pyæmia or surgical fever. It occurs in persons whose constitutions have been broken by preexisting or hereditary causes, and there is produced the lowest and most fatal form of ataxic fever.

Epitome of Treatment.—For acute phlebitis give *Acon.*, *Bell.*, *Lach.*, *Puls.* For suppurative phlebitis, *Hepar s.*, *Merc. sol.*, *Sil.*, and *Sulph.* Erysipelatous phlebitis, with symptoms of typhoid, *Ars.*, *Bap.*, *Acid mur.*, *Carbo veg.*, and *Hyos.* In chronic disease of the veins, *Bell.*, *Cham.*, *Arn.*, *Ham.*, *Phos.*, *Puls.*, *Lyc.*, *Nux vom.*, *Spig*, and *Zinc.*

Special Indications.—**Ac.**—Hot, dry skin; full, bounding pulse; rigors; dry, furred tongue; great thirst and parched mouth.

Bell.—Congestion of the head and face; red face; throbbing headache; brilliant, staring eyes; dilatation of pupils; intense dark redness of the parts involved.

Arsen.—Extreme prostration, dry, brown and cracked tongue; burning thirst, and hot, dry skin.

Carbo. veg.—Venous congestion, with a blue tinge of skin over the whole body, fearful anguish about the heart, and icy coldness of the surface.

Hamam.—Thickness of the veins, with a cord-like feeling; pain along the course of the vein; sub-acute inflammation of veins; swelling of adjoining parts; whitish appearance of the skin; a varicose condition of the veins, with œdema, *Apis.*

Puls.—After the violence of the inflammation has been moderated by *Ac.* or *Bell.*; fever symptoms not severe; particularly suited to females with menstrual irregularities; leucorrhœa, etc.

Hepar s.—Fetid discharge from abscess and purulent infiltration.

Merc. sol.—Thick, flaky pus, or thin, sanious discharge.

Lyc.—Purulent infiltration into the lungs, with expectoration of pus.

Nux vom.—When phlebitis is the resut of high living, with constipation and hemorrhoids.

Local Treatment is rest, hot medicated fomentations of *Ac.*, *Ham.* or *Bell.*, according to indications. In acute cases the diet should be light and nutritious, but when suppuration ensues the system demands support and a generous diet.

CHAPTER IV.

DISEASES OF BONES.

Hypertrophy of Bone consists in an increase of its volume, similar to what occurs in the soft structures, the changes usually being due to inflammatory action. It often appears gradually, without pain or other characteristics of inflammation. The bone is sometimes not only enlarged in its circumference, but in its length, its structure becoming dense, the spongy portion being wholly obliterated with augmentation of its weight.

Treatment.—To effect a cure the cause of the affection must be removed. Due attention must be given to the dietetic and hygienic condition of the patient, and the remedies should be those of medium potencies. The temperament of the patient, the disposition, the character of antecedent diseases, are to be considered in the selection of the remedy. The most appropriate are: *Calc. carb. et phos.*, *Assafœt.*, *Aur.*, *Caust.*, *Kali jod.*, *Lyc.*, *Mez.*, *Phos. ac.*, *Merc.*, *Bar.*, *Sil.*, and *Sulph.* The remedy to be selected according to indications.

Atrophy of Bone consists in the partial absorption of its ele-

mentary constituents, and may occur through continued pressure, deficient nervous influence, insufficient supply of blood, or protracted disease of the part.

In *senile atrophy* the bone becomes exceedingly brittle, with diminution of strength; the animal matter is partially absorbed; the cancellous structure is rarified and many of the vessels wholly obliterated. The neck of the femur is most liable of all bones to this change, this renders old persons particularly prone to fracture of this portion of the bone from slight causes.

Treatment.—This condition does not admit of cure. The general health is to be promoted, and any local cause, when found to exist, should be removed. The chief remedies to be consulted in this affection are: *Calc.*, *Symph.*, *Sil.*, and *Sulph.*

Ostitis.—This is an inflammation of the bony structures, and it may be either *acute* or *chronic*. The acute is more or less diffuse and its favorite seats are the shafts of the long bones. When it extends to the medullary cavity it runs rapidly throughout the whole length of the canal, and it occurs more frequently in children of a scrofulous constitution, whose systems are impaired from want of the necessaries of life. It may be caused, moreover, by exposure to cold and damp.

Diagnosis.—The attack is ushered in by rigors and a high degree of fever, accompanied by deep-seated boring, burning, and throbbing pains in the limb; rapid swelling and œdema, with an erysipelatous blush on the surface, quickly terminating in abscess or caries, with matter pointing at various points, and high fever recurring at night. If the patient recover from the immediate violence of the attack, caries is very prone to occur along the shaft of the bone, and inflammation extending along the medullary canal is very apt to affect the ends of the bones as well as the shaft. Occasionally small *abscesses* form in the bone which contain pus mixed with the debris of the osseous structure. Their most frequent situation is in the cancellous structure at the ends of the tibia. The part swells slightly, is thickened and a deep seated pain is felt; aching, oppressive and intermittent, aggravated by pressure, and worse at night. The patient can place his finger upon the spot where all this disturbance exists. It can generally be traced to an injury.

Treatment.—The appropriate remedies for this and other diseases of the bones to which I will refer in course, will be found at the end of this chapter. For the *acute* variety: *Acon.*, *Bell.*, *Ars.*, *Mez.*, *Merc.*, *Ruta.*, and *Staph.* For the *chronic: Asa.*, *Lyc.*, *Nit. ac.*, *Phos.*, *Sil.*, *Hecla*, *Sulph.*, and *Therid.*

Caries is described by most authors as the molecular death, and disintegration of bone; the bone tissue is soft and vascular, nutrition is either wholly lost or seriously impaired, and as a result of previous inflammation, (ostitis) there is disintegration of the bone structure, ulceration and discharge of bone elements, mingled with pus. It is the *true* inflammation of the third stage of my classification, and is governed by the same principles, runs the same course, and terminates in the same manner as inflammation of the soft parts., viz., by disorganization and finally disintegration. It corresponds to the necro-reparative variety of inflammation, and is a solution of continuity of bone structure, dependent upon molecular death and occurring upon the surface of bone or within its structure. It holds the same relation to necrosis of bone that gangrene holds to mortification, or ulceration holds to sphacelus. When caries takes place within the bone, or in the cancellated structure, it is called *abscess.* The early symptoms of caries are much the same as abscess, and both are preceded with pain, tenderness, redness and swelling, all the phenomena of inflammation being present. The complications following caries are much the same as those which attend the result of inflammation in the soft structures; the tissues are thickened; the skin glazed and of a dusky red; while here and there sinuses are formed which discharge a thin, unhealthy pus, and are ordinarily surrounded by coarse granulations.

Treatment.—In strumous, cachetic, or syphilitic constitutions, or in those of impaired habits, attention should be given to their removal by appropriate means. These consist of change of air, light nutritious food, regular exercise, warm clothing, etc. For the remedies applicable to meet the diseased condition, see special indications at the end of this chapter.

Necrosis is the destruction of bone in mass, and corresponds to the term slough, or sphacelus, in the soft tissues. It affects, chiefly, the hard structure of bone and their shafts, rather than

their articular extremities. It is often produced by injury, and is prone to follow ostitis, and sometimes results from a severe attack of periostitis. Those who are employed in the manufacture of lucifer matches, are exceedingly liable to necrosis of the jaw from inhalation of the fumes of phosphorus.

Exfoliation is applied to that form of necrosis where the surface shell or scale is separated from the adjacent bone; and the term *Sequestrum* when a portion of the deeper structure is thrown off as the result of inflammatory action.

Necrosis, therefore, is preceded by the inflammatory process, viz., pain, tenderness, swelling, œdema and suppuration; the vitality of the bone structure is destroyed by the severity of the attack, and as a consequence, first, caries is developed, then final separation of the dead bone by disintegration and absorption, forming the line of demarcation between the living and the dead structure—necrosis. Until this necrosed portion is removed from the soft structures where it lies, it is a continual source of irritation, like any other foreign body deposited within the tissues, and in its turn keeps up an inflammatory action in all the tissues with which it comes in contact. As soon as the dead bone is separated from the living, the process of repair goes on; granulations are thrown out and the exfoliated bone is pushed away. This is nature's method in overcoming the difficulty, but it some times happens that the sequestrum is too large to be removed in this way, then it is that the new bone throws a wall of ossific structure around it, and envelopes it in a sheath which may take months and perhaps years before it is entirely disposed of. If the suppuration is excessive the system suffers correspondingly, and the patient may die if not relieved by a surgical operation before the offending mass is finally removed.

Treatment.—The first thing to be done is to remove the offending cause just as soon as the work of separation is completed, if it be superficial; but if deep seated, it then becomes a matter of more serious import. In such a case attention should be given to the removal of all predisposing causes; the system improved and strengthened by the best directed efforts, the limb placed in a horizontal position, the sinuses opened, and medicated lotions constantly employed. Then select the appropriate remedy as pointed out under special indications.

Special Indications.—Angustura.—Caries, or very painful ulcers, which affect the bones and pierce them to the marrow, crumbling of pieces of bone.

Asafœtida.—Inflammation and caries of the bones, with thin, fetid pus; bluish redness and swelling of the parts; ulcers with high, hard edges; sensitive to touch; easily bleeding; soft enlargement of bones; also curvature; caries after abuse of mercury; drawing pains in the jaws, and copious salivation.

Aurum.—Secondary syphilis; abuse of mercury, with looseness of the teeth, ulcers of the gums, fetid breath, and heat in the head; ostitis and caries, especially of the palate and nasal bones; ozœna, with excessively fetid discharge; swelling of periosteum of forearms and thighs; exostosis of skull and other bones; boring in the bones; awakened at night by bone pains, which are so severe that he does not want to live.

Belladonna.—Curvature of the lumbar vertebræ; exostosis in the forehead, with caries of the palate; red, shining swelling of the joints; pains along the periosteum.

Calcarea carb.—Curvature of the spine and long bones; crackling and crepitation in the joints, as if they were dry; swelling and softening of the bones, with curvature; exostosis and caries of the extremities, necrosis; caries of the teeth of children; toothache increased by draft or cold; *rachitis*.

Calcarea phosph.—Fistulous ulcers on the ankles; edges callous; ichor putrid.

Calcarea fluorica.—Osteosarcoma; nodes and hard bone swellings.

Carbo animalis.—*Gummata*; benignant suppurations change into ichorous ones; scurvy; rending, tearing pains, caused by salt food, with bleeding of gums and looseness of teeth, the teeth being very sensitive to the least cold.

China.—Carbonaceous caries, commencing with a black spot; most observed in psoric persons, with profuse suppuration and profuse sweat; humid gangrene; parts turn black.

Dulcamara.—Exostosis with ulcers on arms, in consequence of supressed itch; exostosis on upper part of right tibia, with bluish-red spots; suppurating lumps.

Euphorbium.—Caries and diseases of bones; burning in bones.

Fluoric acid.—Diseases of the bones, particularly of the long bones; caries and necrosis especially when they are of a psoric or syphilitic nature.

Gettysburg.—Ulceration of joints involving the bones, with thin, ichorous discharge (sil.)

Hecla lava.—Ostitis; periostitis; exostosis; osteosarcoma; rachitis. It affects mostly the bones of the head, jaws, teeth and legs. Difficulty of dentition.

Lactic acid.—Chronic ostitis; exostosis, especially of the thighs; chicken breast.

Lycopodium.—Arthritic nodosities; softening of the bones; caries and fistulous ulcers, with hard, red, shining, everted edges, and inflammatory swelling of the affected parts, bleeding easily; nocturnal bone pains, especially at the end of the inflamed bones.

Mercurius.—Bone disease; worse at night; the bones feel as if they were broken; scrofulous periostitis; coxarthrocace; caries; nodes; ulcerations of bones; osteocopic pains.

Mezereum.—Pain in the periosteum of the long bones, especially the tibia; worse at night in bed, and in damp weather, when the least touch is unbearable; one side is more affected than the other. Rapid decay of the teeth. Scrofulosis and syphilis.

Nitric acid.—Secondary syphilis; carious ulcers, with irregular edges; exuberant granulations, stinging pains, and easily bleeding; carious teeth, loose and ready to fall out; gums easily bleeding.

Oleum jecoris.—All kinds of scrofulous diseases of the bones, arthrocace, spina ventosa, caries, etc.; fistulous ulcers, with raised edges, easily bleeding, and discharging fetid ichor.

Phosphorus.—Exostosis, especially of the skull, with tearing, boring pains, worse at night; swelling of the tibia; disease of the hip joint, oozing out a watery pus; swelling of the clavicle.

Phos. acid.—Caries of scorbutic patients; pains worse after cold or hot, after external injury of the periosteum there remains a feeling as if the bones were scraped with a knife; interstitial osteitis, scrofulous, syphilitic or mercurial; periosteal inflammation, with burning gnawing pains; external parts turn black.

Phytolacca.—Syphilitic bone diseases; ulcers, with lardaceous bottoms, and with an appearance as if punched out.

Ruta.—Bruised sensation in hip bones, back and coccyx; bruises and other mechanical injuries of bones and periosteum; periostitis, with erysipelatous inflammation of external parts.

Silicea.—Indicated in nearly all diseases of the bones; fistulous openings; discharge offensive; parts around hard and swollen, bluish-red; fibrous parts of joints, especially of the knees, inflamed, all excretions offensive; pus thin; sweat of feet, etc.

Staphisagria.—Podarthrocace; ostitis, especially of the phalanges of the fingers, arthritic nodosities on the joints.

Stillingia.—Scrofulous periostitis.

Sulphur.—Scrofulous and rickety complaints; curvature, softening swelling caries and other bone diseases.

Theridion.—Scrofula, when other remedies fail, rachitis, caries; necrosis; to reach the root of the evil and destroy cause.

Epitome of Treatment.—For interstitial distension of bones; *Asa., Lyc., Merc., Sil., Staph., Calc., Mez., Phos. ac., Sulph.*

For necrosis: *Asa., Calc., Sil., Phos., Sec.*

For ostitis: *Mer., Mez., Sil., Staph., Sulph., Nit.*, and *Phos. ac.*

For softening: *Calc., Merc., Sil., Sulph., Hep., Mez., Phos., Ruta., Sep., Staph.*

For swelling; *Asa., Calc., Lyc., Merc., Phos. ac., Puls., Sil., Staph., Sulph., Guai., Ruta.*

For caries: *Asa., Calc., Merc., Phos. ac., Sil., Aur., Fluor. ac., Mez., Nitr. ac., Ruta., Staph.*

For fracture to promote the reunion of bones: *Calc., Sil., Symphytum.*

For curvatures: *Asa., Calc., Lyc., Merc., Puls., Rhus., Sil., Sulph., Bell., Hep., Nitr. ac., Phos.*

For mercurial: *Aurum, Fluor ac., Kali jod., Phos. ac., Staph., Nitric ac.*

For syphilitic: *Aur., Fluor. ac., Kali jod., Merc. cyan., bijod., cor.*, and *sol., Phos. ac., Phytol.*

Periostitis is an inflammation the investing membrane of the bone and may be either *acute* or *chronic*. It is often produced by exposure to wet and cold, or by external violence, and not unfrequently by an impure state of the blood arising from rheumatism, scrofula or syphilis. The bone lying in close proximity to the periosteum is involved, more or less, in the inflammation, inducing peripheral ostitis.

Symptoms.—Acute periostitis begins with pain in the course of the bone, which is greatly increased by pressure. In its early stages, it is oftentimes difficult to distinguish between it and inflammation of the bone itself. After pain is fully developed the part becomes hot and swollen and thickened, having a circumscribed firm and resisting feel, seldom attaining any size; the skin around becomes red and œdematous. In the course of two or three days suppuration ensues, and the periosteum becomes detached from the subjacent bone. Fever, great restlessness, insomnia, and other evidences of constitutional irritation are present.

Chronic periostitis is less rapid in its course, the tendency of the inflammation being rather to the production and organization of fibrin than suppuration; a flat, hard, circumscribed tumor forms a node which is a deposit of plastic material in the perios-

teum or neighboring parts. There is great pain, especially at night, and the disease is generally referred to syphilitic origin. See syphilitic node, page 107.

Treatment.—The constitutional treatment of acute periostitis is the same as in inflammation elsewhere in fibrous tissues. The local consists in rest position, medicated fomentations, and incisions if the symptoms are very aggravated and do not yield to remedial measures. The following are the remedies to be consulted: *Acon.*, *Aur.*, *Mez.*, *Merc.*, *Phy.*, *Rhod.*, *Staph.*, etc. See special indications at the end of this chapter.

Mollities Ossium—osteo-malacia—is a peculiar disease which seems to depend upon a want of the earthy constituents of bone, with degeneration of animal tissue. The bones are soft, fragile, and brittle, and are often distorted into shapes that cause great inconvenience and distress. It is a rare disease, occurs more often in women than in men, and is particularly associated with the child bearing period. Unlike rickets it occurs in adult life, and when once developed it continues to grow worse. It may be confined to a few bones or it may affect the entire skeleton. The urine is ordinarily loaded with phosphates, which are eliminated from the bony structure and excreted by the kidneys. At the outset of the disease the patient is observed to be ailing, emaciates, complains of violent achings in the bones, with feebleness and great prostrations. Then from a fall or some slight injury, a bone is broken, and perhaps it unites again, and this condition goes on until the patient becomes bed-ridden; now great distortion takes place and death occurs from exhaustion or compression of the lungs. Its cause has been assigned to cancer, but, I think, without reason.

Treatment.—The treatment consists in giving attention to constitutional defects, and the restoration of the vital forces; a generous diet, well regulated hygienic and dietetic regimen, and all muscular exertion to be avoided, constitute the principal constitutional means to be employed. Little, so far, has been accomplished by medicines; those most suitable to the disease are: *Merc.*, *Kali jod.*, *Phos. ac.*, *Staph.*, *Calc.*, *Lyc.*, *Brucea*, *Sil.*, **Lact. ac.*, *Pinus syl.*, and *Ferrum*.

* Experiments with this remedy show its influence over bony structure. Giving the drug to a healthy animal for a long time has given rise to many conditions of rachitis and osteo malacia.

The local treatment consists of mechanical supports, having them light and strong. Little permanent good, however, so far, has been effected in this disease by internal medication.

Rachitis is a disease of the bones dependent upon a constitutional disorder allied to scrofula. It is an affection of early life, and generally shows itself about the period when children begin to walk. The natural curves of the bones are increased, the shafts do not lengthen proportionately, and the extremities become enlarged. Its characteristics are most apparent in the lower limbs that have the weight of the body to sustain; the spine and pelvis are also interested in the disease; the legs are short, thick, and bent forwards and outwards; the pelvis is compressed and deformed, the spine shows evidence of lateral curvature, and the cranial bones become expanded with an undue prominence of the forehead. There is a deficiency of the earthy salts, and at the same time there is an expansion of the cancellated structure. Local treatment is rest in the recumbent position, out-door exercise in a carriage or on horseback, and if the spine is affected, the plaster jacket or light mechanical support should be worn.

Spina Bifida is a congested malformation wherein the spinal processes of the vertebræ are deficient, leaving the laminæ open, which permits expansion of the coverings of the cord, and a tumor is formed by the pressure of the cerebro-spinal fluid. It occurs at the lower part of the spine in the lumbar and sacral vertebræ. It is an elastic, fluctuating tumor while patient is erect, formed in the mesial line of the body, and is about the size of an orange. When the patient lies down it becomes soft and lax. The skin covering it is usually congested and blue. If left unattended to, it may ulcerate and burst, placing the life of the patient in great jeopardy; under other circumstances it seems to give little or no annoyance, and the patient grows up to manhood without any serious result.

Treatment consists in making equable pressure upon the tumor by means of a concave pad. Puncturing the sac with the aspirator needle and drawing off the contents of the sac gradually from time to time, and applying pressure as before advised. Dr. Morton, of Glasgow, recommends tapping the tumor and

throwing therein a solution of iodine. Brainard's injection, which has proved the most successful, is composed of five grains of iodine, fifteen of iodide of potassium, and one ounce of water. Removal by the ecraseur has been tried but has failed. Mouchet has been tolerably successful by applying the elastic ligature to the base of the tumor, and then puncturing the sac. Helmuth rather favors the injection process of Brainard, but as a rule these processes are unsuccessful, and the little sufferers die of convulsions. No internal treatment has effected any marked good results. The remedies best adapted to control the morbid process involving the bony structure in the last named diseases, are the following, viz.: *Asa.*, *Brucea.*, *Ant.*, *Baryt. c.*, *Bell.*, *Calc. carb. et phos.*, *Fluoric ac.*, *Kali jod.*, *Lyc.*, *Lactic ac.*, *Mez.*, *Phos, ac.*, *Ruta*, *Sil.*, *Staph.*, *Sulph.*, and *Therid.*

Special Indications—Assafœt.—Soft enlargement and curvature of bones; scrofulous, bloated children with enlargement of glands.

Baryt. c.—Imperfect development; child dwarfed mentally and physically; glands indurated; abdomen hard and distended; face puffed; general emaciation.

Brucea ant.—The feet are turned outwards, and children walk on their inner ankles (**Talipes valgus**).

Calc. c.—Fontanels are late closing, dentition late, walking delayed; abdomen bloated and enlarged; extremities deformed, child is bow-legged, curvature of spine.

Calc. p.—Skull soft and thin, with crackling noise when pressed upon; delayed closure of fontanels; sallow, earthy complexion; face pimpled; retarded dentition; emaciation; lateral curvature (left); swollen cendyles on forearms and legs; spina bifida: non-union of broken bones; Pott's disease; sytemic dyscrasias.

Fluoric ac.—Disease of long bones; weakly constitution; sallow complexion; emaciation; bony tumors on the ends of the long bones; exostosis; youthful dyscrasias.

Kali hyd.—Swelling of the bones; exostosis; decaying teeth; tearing, darting pains in all the limbs; great emaciation; rachitis.

Lycop.—Glandular swellings; softening of bones; osteocopic pains; swelling of the ends of the long bones; emaciation.

Mezer—Bones inflamed and swollen; joints painful and weary, as if they would give way; caries; mercurialism; diseases of youth.

Pinus syl.—Scrofulous affections; slowness to acquire the use of limbs; weakness of bones.

Phos. ac.—Pale, sickly look, great debility, tottering gait; interstitial ostitis; exostosis.

Ruta.—Painful joints; contraction of tendons; periostitis; open fontanels; bones feel sore as if bruised; sprains.

Sil.c.—Head too large for body; emaciation with pale face; ulceration and necrosis of bones; cellular inflammations; enchrondroma; deep-seated pains in bones and joints (ostitis); loss of power in limbs; spinal curvature; Pott's disease; ulcerations and necrosis of bones; bone felons; exostosis. Hecla lava follows well this remedy.

Staph.—Black, crumbling teeth; caries of teeth; painful swelling in bones; suppuration of bones; ostitis; arthritic nodosities on joints.

Sulph.—Fontanels close late; pale, sickly looking face; curvature of spine; softness vertebræ; Pott's disease; for youthful dyscrasias.

Therid.—Scrofulous affection of bones, when all other remedies fail; spinal diseases; arthritis; caries; necrosis; diseases of youth. It destroys the disease generating cause.

Sub-cutaneous Osteotomy.—Mr. Bradley divides the integument with a tenotome, and cuts through the bone with a very fine saw, then straightens the limb, putting them in light appropriate splints, and covering the wound with collodion. * Dr. Bœckel cuts down to the periosteum, peels it off and divides the

* Abstract of Medical Science, vol. iii, No. 7.

bone with a hammer and chisel, dresses the wound after Lister's method, and straightens the bones after cicatrization. In this way he has operated nine times successfully.

In all cases of softening of bones, attention should be given to the articles of food used; those containing larger proportions of lime, phosphorus, and other constituents of bone are to be preferred. The use of cereals, wheat, rye, oats and corn, are of the greatest advantage. Gentle exercise in the open air, with the best directed hygienic and dietetic influences should occupy no small portion of the treatment.

INDEX.

A

PAGE.

Abscess, acute 19
Abscess, chronic 19
Abscess, definition of 19
Abscess, specific 19
Abscess, treatment of 20
Abscess, urinary 79
Abdomen, gun-shot wounds of .. 52
Acute periostitis 178
Adenoma 123
Air into veins 171
Alopecia syphilitica 108
Amputation after gun-shot 53
Anthrax 37
Analysis of pus 17
Aneurism, varicose 167
Angionoma 125
Arrest of hemorrhage 40
Arteries, diseases of 39
Arterial hemorrhage 40
Arterial hemorrhage, arrest of .. 40
Artery, torn and wounded 41
Asperma 106
Atheroma 39
Atrophy of bone 173
Atrophy of bone, senile 174

B

Balanitis 59
Bed sore and treatment 28
Bibron's antidote 49
Bite of mad animals 49
Bite of serpents 49
Boils and treatment 36
Bladder, inflammation of 60
Blenorrhagia 55
Bone, abscess in 74
Bone, atrophy of 173
Bone, aneurism in 130
Bone, caries of 175
Bone, cystoma in 129
Bone, exfoliation of 176
Bone, hytadids in 129
Bone, malignant tumors in 130
Bone, necrosis of 175
Bone, pulsating tumor in 130
Bubo of chancroid 89
Bubo, indolent 89
Bubo, simple 89
Bubo, spontaneous 90
Bubo, virulent 89

PAGE.

Bunion 145
Burns and scalds 33
Burns, varieties of 33
Bursal tumors 117

C

Calcareous degeneration 39
Cancer of the testicle 70
Capillary hypertrophy 126
Capillary hemorrhage 42
Carbuncle and treatment 37
Carcinoma colloid 149
Carcinoma encephaloid 148
Carcinoma melanotic 149
Carcinoma scirrhus 146
Caries of bone 175
Cellular inflammation 14
Chancre and chancroid 93
Chancre, urethral 96
Chancre, treatment of 97
Chancroid 88
Chancroidal bubo 88
Chest, gun-shot wounds of 52
Chilblains 35
Chronic abscess 19
Chronic periostitis 178
Chloroform in tetanus 164
Clavi 144
Classification in inflammation .. 14
Concussion of nerves 158
Colloid cysts 123
Cold, effects of 35
Condylomata 67
Constitutional syphilis 101
Contused wounds 48
Cystitis 60
Cystoma 116
Cystoma in bone 129
Cysts in bone 122
Cysts, congenital cutaneous 122
Cysts, mucous 122
Cysts, proliferous 120
Cystic sarcocele 69
Cysts, sarcoma 121
Cysts, sanguinious 122
Cysts, synovalis 117

D

Death of bone 175
Definition of syphilis 92

	PAGE.
Degeneration, calcareous	39
Demarcation, line of	26
Diagram of strapped testicle	59
Diathesis, hemorrhagic	169
Differentiation of chancroid and syphilis	93
Dilatation of stricture	74
Diseases of arteries	39
Diseases of bone	127
Dissecting wounds	50
Distinctive character of gonorrhœa	54
Dry gangrene	26
Dr. Otis' urethro-meter	73
Duration of chancre	92
Dying, the process of	26

E

Effects of cold	35
Electrolysis for stricture	77
Embolism	40
Entrance of air into veins	171
Encephaloid cancer	148
Enchondroma	139
Enchondroma of testicle	70
Enucleation for cancer	150
Epithelioma	140
Epispadias	70
Equinia	53
Etiology of inflammation	15
Excision for cancer	150
Excision for chancre	97
Exostosis, eburnated	128
Exostosis, hard	127
Exostosis, spongy	127
Exfoliation of bone	176
External urethrotomy	76
Extravasation of urine	78

F

Farcy	53
Fatty tumor	124
Fever, traumatic	29
Fibroid tumor of penis	68
Fibroma	133
Fibro-cellular tumor	135
Fibro-myoma	136
Fibro-mucous	136
Fibro-neuroma	136
Fibro-neuroma traumatica	137
Fibro-plastic tumor	134
Fistula, urinary	79
Frost-bite	35
Furunculus	36

G

Galvano-magnetism in stricture	77
Ganglias	119
Gangrene	26
Gangrene, causes of	26
Gangrene, hospital	27
Gangrene, treatment of	28
Gangrene, varieties of	18
Gangrene of the penis	68
Gelatiform cancer	149
Glanders	53
Gleet, or decline of, 3d stage	55
Glioma	137
Gonorrhœa	54
Gonorrhœa in women	86
Gonorrhœal ophthalmia	89
Gonorrhœal rheumatism	85
Gonorrhœal urethritis	87
Gonorrhœal vulvitis	86
Gun-shot wounds	52
Gun-shot of abodomen	52
Gun-shot of chest	52
Gun-shot, operation after	53
Gun-shot, treatment of	52

H

Healing by first intention	16
Healthy ulcer	21
Heat in inflammation	13
Hectic fever	32
Hemorrhage, arterial	41
Hemorrhage, capillary	42
Hemorrhagic diathesis	42
Hemorrhage, natural arrest of	40
Herpes of the prepuce	66
Horny growths	143
Horny excresences	67
Horns upon the nails	143
Hospital sore	27
Hydatids	117
Hydatids in bone	129
Hydrophobia	40
Hydro-rachitis	180
Hygromata	117
Hyper-plastic inflammation	14
Hypertrophy of bone	173
Hypertrophy, capillary	126
Hypertrophy of prepuce	67
Hypospadias	70

I

Ice in tetanus	164
Ichorœmia	29
Impotence	106
Incised wounds	46
Incubation of chancre	92
Indolent ulcer	22
Indolent ulcer, treatment of	22
Indolent bubo	89
Induration in inflammation	16
Infantile syphilis	118
Inflamed ulcer	23
Inflammation, classification of	14

	PAGE.
Inflammation, definition of	9
Inflammation, etiology of	15
Inflammation, exciting causes of	16
Inflammation, heat in	13
Inflammation, induration of	16
Inflammation, microscope in	16
Inflammation, mortification in	18
Inflammation, pain in	12
Inflammation, redness in	12
Inflammation, softening in	17
Inflammation, suppuration in	17
Inflammation, swelling in	13
Inflammation, termination in	16
Inflammation, treatment of	18
Inflammation, tumefaction in	16
Inflammation, ulceration in	18
Inflammation, variations in	11
Inflammation, various theories of	9
Injections in gonorrhœa	56
Injections in vagina	87
Irritable ulcer	21
Ischuria	61

K

Keloid	145
Keloid, excision for	146
Keloid, treatment for	146

L

Lacerated wounds	47
Lachesis in gangrene	25
Laudable pus	18
Lipoma	124
Laws of projectiles	51
Ledum in punctured wounds	49
Ligature in hemorrhage	41
Lockjaw	162
Lymph, organization of	14
Lymphatic tumors	123

M

Mad-stone in poisoned wounds	50
Malignant tumors	146
Mechanical dilatation in stricture	74
Melanosis in bone	130
Marriage in spermatorrhœa	106
Malignant bone tumors	130
Medical applications	19
Melanosis	149
Mercury in inflammation	19
Mercury in syphilis	94
Mercury and syphilis compared	94
Metastatic abscess	20
Microscope in inflammation	16
Minute structure of enchondroma	129
Minute structure of fibroma	134
Minute structure of lipoma	124
Mixed chancre	91
Mixed chancre of Rollet	96
Moist gangrene	18
Moles	127
Mollities ossium	179
Mortification	25
Mortification, causes of	26
Mortification idiopathic	26
Mortification in inflammation	18
Mortification, treatment of	25
Mucous cysts	122

N

Nævi materni	126
Nature of inflammation	10
Necrosis of bone	175
Necrosis, operation for	176
Necrotic inflammation	14
Necrotic reparative	14
Nerves, concussion of	158
Nerves, wounds of	157
Nerve stretching	159
Neuroma	137
Node of syphilis	107

O

Onychia syphilitica	108
Ophthalmia gonorrhœa	83
Operative nerve stretching	160
Opisthotonos	162
Orchitis, acute	58
Orchitis chronic	68
Organic stricture	72
Orifices in gun-shot	51
Ossium fragilitas	179
Ossium mollities	179
Osteoma	127
Osteo-aneurism	130
Osteo-cephaloma	130
Osteo-chondroma	130
Osteo-myeloid	131
Osteo-sarcoma	130
Osteo-malacia	179
Ostitis	174
Ostitis syphilitica	107
Otis' treatment of stricture	73
Otis' urethra-meter	73
Otis' urethrotome	76

P

Pain in inflammation	12
Painful tubercle	136
Papillomata	141
Paraphimosis	60
Pathology of epithelioma	140
Pathology of inflammation	10
Pathology of sarcocele	68

CONTENTS.

PART X.

INJURIES AND DISEASES OF JOINTS.

CHAPTER I.

SPRAINS.

	PAGE.
Sprains	25
" Seat of	26
" Etiology of	26
" Predisposing causes of	26
" Symptoms of	27
" Diagnosis of	28
" Treatment of	29
Rupture of a muscle	33
" " Mechanical treatment of	34

CHAPTER II.

WOUNDS OF JOINTS.

Wounds of Joints	37
" " Symptoms of	38
" " Complications of	39
" " Treatment of	39
Compound fracture of Elbow joint	42
" " Hip joint	43
" " Knee joint	44
" " Ankle joint	45

CHAPTER III.

SYNOVITIS.

Synovitis—Etiology of	47
" Symptoms of	47
" Termination of	48
" Treatment of	49

CHAPTER IV.

ARTHRITIS.

Arthritis—Etiology of	56
" Symptoms of	56
" Treatment of	58

CHAPTER V.

DROPSY OF THE JOINTS.

Dropsy of the Joints—Etiology of	60
" " " Symptoms of	60
" " " Pathology of	61
" " " Treatment of	61

CHAPTER VI.

WHITE SWELLING.

PAGE.
White Swelling..... 65
" Symptoms of..... 66
" Prognosis of..... 66
" Treatment of..... 67

CHAPTER VII.

ANCHYLOSIS.

Anchylosis..... 69
" Varieties of..... 70
False anchylosis..... 70
" " Etiology of..... 0
" " Treatment of..... 1
True anchylosis..... 75
" Etiology of..... 76
" Symptoms of..... 76
" Prognosis of..... 76
" Treatment of..... 77
Excision of anchylosed joints..... 79

CHAPTER VIII.

MOVABLE CARTILAGES.

Movable or False Cartilages..... 80
" " " Etiology of..... 81
" " " Symptoms of..... 81
" " " Diagnosis of..... 82
" " " Prognosis and treatment of..... 82

CHAPTER IX.

COXALGIA.

Coxalgia, Morbus Coxarius and hip disease..... 84
" Etiology of..... 85
" Symptoms of..... 85
" Diagnosis of..... 90
" Prognosis of..... 93
" Treatment of..... 93
Mechanical means adopted in the treatment of Morbus Coxarius, by H. G. Davis, M. D., New York..... 97
Excision of the Head of the Femur..... 106

PART XI.

AFFECTIONS OF THE MUSCLES, TENDONS AND BURSÆ.

CHAPTER I.

MUSCLES AND TENDONS.

SECTION I.—Laceration of muscles—symptoms of..... 108
" " treatment of..... 109
SECTION II.—Rupture of tendons—treatment of..... 110
Dislocation of tendons..... 111
Hypertrophy of tendons..... 111

CHAPTER II.

AFFECTIONS OF THE BURSÆ MUCOSÆ.

SECTION I.—Inflammation of the bursæ..... 112
Acute bursitis..... 112

PAGE.
Acute bursitis—treatment of..... 112
Chronic bursitis..... 113
" varieties of..... 114
" symptoms of..... 114
§ 1. Ganglion..... 114
" treatment of..... 115
§ 2. Housemaid's knee..... 116
" " treatment of..... 117

CHAPTER III.

WHITLOW.

Whitlow, felon or paronychia..... 118
" " " etiology..... 119
" " " symptoms..... 119
" " " treatment..... 120
" " " surgical interference..... 123

CHAPTER IV.

TOE NAIL ULCER.

Toe nail ulcer—prognosis of..... 125
" " treatment of..... 126
" " palliative treatment..... 126
" " radical treatment..... 126
Inverted toe nail..... 128
Bunion..... 128
" treatment of..... 129

PART XII.

INJURIES OF REGIONS.

CHAPTER I.

INJURIES OF THE HEAD.

Injuries of the head..... 130
Cerebral disturbance..... 130
Concussion..... 131
" symptoms of..... 131
" terminations of..... 132
Compression..... 133
" symptoms of..... 133
" diagnosis of..... 133
Irritation of the brain..... 134
" " " symptoms of..... 134
Traumatic and encephalitis..... 134
" " " pathology of..... 135
" " " symptoms of..... 136
Acute encephalitis..... 136
Chronic or subacute encephalitis..... 136
" " " " diagnosis of..... 137
" " " " pathology of..... 137
" " " " treatment of..... 138
Subacute encephalitis..... 140
Abscess of the brain or softening..... 143

CHAPTER II.

INJURIES OF THE SCALP.

SECTION I.—Contusions of the scalp..... 143
" " " treatment of..... 144
Wounds of the scalp..... 144

PAGE.

§ 2. Wounds of the brain and its membranes... 146
" " " " " symptoms of..... 146
" " " " " treatment of..... 148
Fungus or hernia cerebri..... 149
" " " treatment of..... 149
§ 3. Extravasation of blood within the skull..... 150
" " " " diagnosis of..... 151
" " " " treatment of..... 152
Operation of trephining..... 153
SECTION II.—Injuries of the spine..... 153
" " " pathology of..... 154
" " " treatment of..... 155
Wounds of the spinal cord..... 155
Injury in the lumbar region..... 156
Injury of the upper dorsal region..... 156
Injury of the lower cervical vertebræ..... 157
Treatment of injuries of the spine..... 157
Myelitis..... 158
SECTION III.—Injuries of the face. Salivary fistula..... 159
Injuries of the eye ball..... 159
Wounds " " 160
Penetrating wounds of the eyeball..... 160
Treatment " " " 161
Wounds of the tongue..... 161
SECTION IV.—Wounds of the neck..... 162
1. Above the hyoid bone..... 163
2. In the thyro-hyoid space..... 163
3. In the larynx..... 163
4. In the trachea..... 163
Treatment of wounds in the neck..... 163
SECTION V.—Wounds of the chest. Non-penetrating wounds..... 165
Wounds of the lung—symptoms of..... 165
Emphysema..... 166
" symptoms of..... 167
Traumatic pneumonia..... 168
Empyema..... 168
Treatment of wounds in the chest..... 169
SECTION VI.—Hernia of the lung or pneumocele..... 171
Thoracic fistula..... 172
SECTION VII.—Wounds of the heart and large vessels..... 172
" " " " " symptoms of. 173
" " " " " treatment.... 173
SECTION VIII.—Injuries of the abdomen..... 174
1. Contusions " " 174
" " " symptoms of..... 175
2. Non-penetrating wounds of the abdomen..... 175
3. Penetrating " " " 176
Protrusion of intestine..... 176
Wounds of abdomen, after-treatment of..... 178
SECTION IX.—Injuries of the pelvis..... 180
Wounds of the bladder..... 180
" " " symptoms of..... 181
" " " treatment of..... 182
Laceration of the urethra—treatment of..... 183
" " Perineum..... 184
" " " prognosis of..... 184
" " " time for operation..... 185
" " " preparation of the patient..... 186
" " " Baker Brown's operation..... 186
" " " Sims's operation..... 188

PART XIII.

AFFECTIONS OF THE BLOOD VESSELS.

CHAPTER I.

ANEURISM.

PAGE.
Definition 191
Varieties 191
Dissecting 192
Pathology 192
Symptoms 192
Differential diagnosis of tumors as distinguished from aneurisms .. 196
Growth of aneurism 196
Etiology 197
Prognosis 198
Situation 198
Spontaneous cure 199
Treatment 199
Regimen 203
Surgical treatment 205
Pressure and bandaging 205
The effects of pressure 209
Digital compression 211
Continued flexion 212
The ligature 213
Manipulation 214
Galvano-puncture 215
Injections 216
Acupressure 216

PART XIV.

LIGATION OF ARTERIES.

CHAPTER I.

Rules to be observed in the ligation of arteries 217

CHAPTER II.

OPERATIONS ON THE ARTERIES.

Ligation of the Innominata or brachio-cephalic 221
" " " Common carotid 222
" " " External " and its branchas 226
" " " Superior thyroid artery 226
" " " Lingual " 226
" " " Facial " 227
" " " Occipital " 227
" " " Temporal " 227
" " " Subclavian " 227
" " " Vertebral " 229
" " " Internal mammary " 229
" " " Inferior thyroid " 230
" " " Axillary " 230
" " " Brachial " 231
" " " Radial and ulnar arteries 232
" " " Abdominal aorta artery 233
" " " Common iliac " 233
" " " Internal iliac " 235

PAGE.
Ligation of the Gluteal artery 235
" " " Sciatic artery 236
" " " External iliac artery 236
" " " Epigastric " 237
" " " Circumflex iliac " 237
" " " Femoral " 238
" " " Deep femoral " 239
" " " Popliteal " 239
" " " Anterior tibial " 240
" " " Dorsal " 241
" " " Posterior tibial " 241
" " " Peroneal " 242

PART XV.

DISLOCATIONS OR LUXATIONS.

CHAPTER I.

GENERAL CONSIDERATIONS.

Dislocation, or luxation 243
Varieties 243
Complete, incomplete, primitive, partial 243
Consecutive or secondary 244
Simple, compound, complicated, recent 244
Old luxation 244
Seat of luxation 244
Causes 244
General symptoms 245
Loss of function 245
Deformity 246
Diagnosis 246
Differential diagnosis between dislocation and fracture 247
Preternatural mobility 247
Crepitus 247
Facility of reduction 248
Prognosis 248
Pathology 248
Treatment 249
Reduction 249
Compound dislocation 252
Dislocation and fracture 253

CHAPTER II.

DISLOCATION OF THE BONES OF THE HEAD AND TRUNK.

SECTION I.—Dislocation of the jaw 253
" " " inferior maxilla 253
Anatomical relations 254
Pathology 254
Symptoms 254
Prognosis 255
Reduction 255
After-treatment 256
Subluxation 256
Treatment 257
Congential dislocation 257
Treatment 257
SECTION II.—Dislocations of the bones of the trunk 257
§ 1. " " " vertebræ 257
Symptoms, diagnosis, prognosis, treatment 258

PAGE.
§ 2.—Dislocations of the ribs 259
Treatment 259
§ 3.—Dislocations of the clavicle 260
" " " Sternal end forward 260
" " " " " " pathology 261
" " " " " " reduction 161
" " " " " backward 261
" " " " " " pathology 262
" " " " " " reduction 262
" " " " " upward 262
" " " " " " pathology 262
" " " " " " reduction 262
" " " Acromial end upward 263
" " " " " " pathology 263
" " " " " " reduction 263
" " " " " downward 264
" " " " " " pathology 264
" " " " " " reduction 264
" " " Beneath the coracoid process 264
" " " " " reduction 265
§ 4.—Displacement of the latissimus dorsi 265
reduction 266

CHAPTER III.

DISLOCATIONS OF THE UPPER EXTREMITY.

SECTION I.—Dislocations of the shoulder 266
Etiology 266
Varieties 267
1.—Downward
2.—Forward 267
3.—Backward
§ 1. Dislocation of the humerus downward 267
Pathology 267
Symptoms
Diagnosis .....
§ 2. Dislocation of the humerus forward 269
Pathology
Symptoms 269
Diagnosis 270
§ 3. Dislocation of the humerus backward 271
Pathology
Symptoms 271
Treatment
Reid's method by rotation and elevation of the humerus. 274
Extension and counter-extension 276
After-treatment 279
Œdema 279
Emphysema 280
§ 4. Complicated dislocations of the shoulder 280
Anomalous " " " 281
Symptoms 281
Treatment 282
Congenital dislocations 282
Symptoms 282
Treatment 282
SECTION II.—Dislocations of the elbow joint 283
Varieties 283
§ 1. Dislocation of the bones of the forearm backward 283
Causes 283

PAGE.

Pathology ... 283
Symptoms—diagnosis ... 284
Prognosis—treatment ... 285
After-treatment ... 287
§ 2. Dislocation of the bones of the forearm forward ... 287
Symptoms ... 287
Treatment ... 288
§ 3. Lateral Dislocation of the elbow ... 288
Dislocation outward—symptoms ... 288
Dislocation inward—symptoms ... 289
Treatment ... 289
§ 4. Dislocation of the ulna backward ... 289
Symptoms—treatment ... 289
Compound dislocations ... 289
SECTION III.—Dislocation of the radio-ulnar joints ... 290
§ 1. Dislocation of the head of the radius ... 290
Dislocation forward—symptoms ... 290
" " treatment ... 291
" backward ... 291
Symptoms and treatment ... 292
Dislocation outward—symptoms ... 292
" " treatment ... 293
SECTION IV.—Dislocation of the wrist ... 293
§ 1. Dislocation of the carpal bones backward ... 294
§ 2. " " " " forward ... 294
Treatment ... 295
§ 3. Dislocation of the lower extremity of the ulna ... 295
Dislocation backward and forward—treatment ... 296
SECTION V.—Dislocation of the carpal bones ... 296
§ 1. Dislocation of the os magnum ... 297
Reduction ... 297
§ 2. Dislocation of the os pisiform ... 297
§ 3. Dislocation of the os cuneiform ... 297
SECTION VI.—Dislocation of the metacarpal bones ... 298
§ 1. Dislocation of the metacarpal bones of the thumb and fingers ... 298
Symptoms and reduction ... 298

CHAPTER IV.

DISLOCATIONS OF THE LOWER EXTREMITY.

SECTION I.—Dislocations of the hip joint ... 300
Varieties ... 301
§ 1. Dislocations backward and upward on the dorsum ilii ... 302
Etiology and symptoms ... 302
Diagnosis and pathology ... 304
Treatment ... 305
Reid's method of reducing an iliac dislocation ... 306
Reduction by extension and counter-extension ... 309
Jarvis's Adjuster ... 311
After-treatment ... 311
§ 2. Dislocations backward and downward into the great sciatic notch ... 311
Etiology—symptoms ... 311
Pathology and treatment ... 313
§ 3. Dislocations forward and downward into the thyroid foramen ... 314
Etiology—symptoms ... 314
Pathology and treatment ... 315
After-treatment ... 317

PAGE.
§ 4. Dislocations forward and upward upon the pubes..... 317
Etiology and Symptoms..... 317
Pathology and treatment..... 318
§ 5. Anomalous dislocations of the hip..... 321
§ 6. Chronic " " " 323
§ 7. Congenital " " " 323
Etiology..... 324
Pathology—prognosis..... 325
Malformation of the pelvis..... 325
Treatment..... 326
SECTION II.—Dislocations of the knee..... 329
Backward, forward, inward and outward..... 329
Etiology..... 329
Pathology..... 330
Treatment..... 331
§ 2. Dislocations of the semilunar cartilages..... 331
Symptoms and treatment..... 332
§ 3. Compound dislocation of the knee..... 333
Resection..... 333
§ 4. Dislocations of the patella..... 334
1. Outward—symptoms, treatment..... 334
2. Inward and vertically—symptoms..... 335
Reduction—treatment..... 336
SECTION III.—Dislocation of the fibula..... 337
§ 1. Dislocations of the superior extremity of the fibula..... 337
§ 2. " " inferior " " " 338
Treatment..... 338
SECTION IV.—Dislocations of the ankle..... 338
Varieties..... 339
§ 1. Dislocation of the ankle joint forward..... 339
Symptoms..... 339
§ 2. Dislocation of the ankle joint backward..... 340
Symptoms—treatment—after-treatment..... 340
§ 3. Dislocation of the ankle inward..... 341
Causes—symptoms..... 341
Treatment..... 342
§ 4. Dislocation of the ankle outward..... 342
Symptoms..... 342
Treatment..... 343
§ 5. Compound dislocation of the ankle..... 343
SECTION V.—Dislocations of the bones of the foot..... 344
§ 1. Dislocations of the astragalus..... 344
Varieties..... 344
Symptoms—prognosis..... 345
Treatment..... 346
After-treatment..... 347
§ 2. Dislocation of the tarsal and metatarsal bones..... 347
Calcaneum..... 347
Scaphoid, cuboid and cuneiform..... 348
Treatment..... 349

PART XVII.

FRACTURES.

CHAPTER I.

GENERAL CONSIDERATIONS.

Etiology.....
Causes—predisposing and exciting..... 351
..... 352

PAGE.
SECTION I.—Simple fractures..... 353
Rational and physical symptoms and prognosis..... 353
Process of repair..... 354
First stage, or uniting period..... 354
Treatment..... 356
Apparatus..... 357
Splints..... 358
After-treatment..... 361
Special apparatus..... 362
After-treatment..... 363
Compound fracture..... 366
Definition, dangers and treatment..... 366
Non-union and false joint—treatment..... 368

CHAPTER II.

FRACTURES OF THE BONES OF THE FACE.

SECTION I.—Fracture of the nasal bones..... 370
Symptoms..... 370
Prognosis—treatment..... 371
Fracture of the lachrymal bones..... 372
Treatment..... 372
Fracture of the zygoma..... 372
§ 2. Fracture of the superior maxillary bone..... 372
Treatment..... 373
§ 3. Fracture of the malar bone..... 373
Treatment..... 374
§ 4. Fracture of the inferior maxilla..... 374
Symptoms..... 374
Mobility of the fragments..... 375
Treatment..... 375

CHAPTER III.

FRACTURES OF THE NECK AND TRUNK.

SECTION I.—Fracture of the bones of the neck..... 378
§ 1. " " os hyoides..... 378
Symptoms..... 378
Treatment..... 379
§ 2. Fracture of the vertebral column..... 379
Symptoms..... 379
Treatment..... 380
§ 3. Spinal concussion and meningitis..... 381
Symptoms..... 381
Treatment..... 382
SECTION. II.—Fractures of the bones of the trunk..... 382
§ 1. " " ribs..... 382
Symptoms..... 382
Crepitation..... 382
Emphysema..... 383
Prognosis—treatment..... 383
Constitutional treatment..... 385
§ 2. Fractures of the sternum..... 385
Treatment..... 386

CHAPTER IV.

FRACTURES OF THE UPPER EXTREMITY.

SECTION I.—Fractures of the clavicle..... 387
Causes..... 387
Pathology—symptoms..... 388
Prognosis—treatment..... 389

PAGE.

SECTION II.—Fractures of the scapula..... 393
" " " acromion process..... 393
Diagnosis..... 394
Treatment..... 395
Fractures of the coracoid process..... 395
Treatment..... 396
Fractures of the neck of the scapula..... 396
Diagnosis—treatment..... 397
Fractures of the body of the scapula—treatment..... 398
SECTION III.—Fractures of the humerus..... 399
§ 1. Fracture of the head and anatomical neck..... 399
Symptoms..... 400
Within the capsule..... 400
Without the capsule..... 400
Treatment..... 401
§ 2. Fracture of the surgical neck..... 401
Symptoms..... 402
Prognosis and treatment..... 403
§ 3. Fracture of the shaft—symptoms..... 406
Prognosis and treatment..... 407
§ 4. Fracture of the condyles..... 408
" " " symptoms of..... 409
" " " prognosis of..... 410
" " " treatment of..... 410
Compound fracture of the condyles..... 410
" " " arm..... 411
SECTION IV.—Fractures of the forearm..... 411
§ 1. " " both bones of the forearm..... 411
" " " " symptoms of. 411
" " " " prognosis of. 412
" " " " treatment of. 412
§ 2. " " shaft of the radius..... 413
" " " " symptoms of..... 413
" " " " treatment of..... 413
Superior extremity..... 414
" " symptoms..... 414
" " treatment..... 415
Lower extremity..... 415
Barton's fracture..... 415
" " diagnosis of..... 416
Colle's " 417
" " diagnosis of..... 418
" " prognosis of..... 419
" " treatment of..... 419
Hamilton's method..... 420
" apparatus..... 421
Barton's method..... 422
Bond's " 423
§ 3. Fractures of the ulna..... 424
" " " symptoms..... 425
" " " prognosis..... 425
" " " treatment..... 425
§ 4. " " olecranon process..... 426
" " " " symptoms..... 426
" " " " prognosis..... 42
" " " " treatment..... 427
Dessault's dressing..... 427
§ 5. Fracture of the coronoid process..... 431
Symptoms—prognosis—treatment..... 432

PAGE.
SECTION IV.—Fracture of the hand and fingers 433
§ 1. " " carpus 433
§ 2. " " metacarpus 434
" " " treatment 434
" " " compound 435
§ 3. " " phalanges 435
" " " treatment 435
SECTION V.—Fractures of the femur 435
§ 1. " " neck of the femur within the capsule. 436
Causes 437
Symptoms 437
1. Shortening of the thigh 437
2. Eversion of the foot 438
3. Preternatural mobility 438
4. Crepitation 438
5. Change of position in the trochanter major 439
6. Pain at the site of injury 439
7. Peculiarity of position 439
Differential diagnosis between fracture and luxation 439
" " " intra and extra capsular fracture 440
Treatment 441
§ 2. Fracture of the neck of the femur without the capsule ... 444
Symptoms 444
Diagnosis—prognosis—treatment 445
Prof. E. A. Clark's suspension splint 447
§ 3. Impacted fracture of the neck 452
Symptoms—prognosis—treatment 453
§ 4. Fracture of the great trochanter 453
Symptoms—prognosis—treatment 453
Compound fractures of the neck 454
§ 5. Fracture of the shaft 454
Symptoms—prognosis 454
Treatment 455
Hodge's splint 457
Smith's " 459
Dr. Swinbourne's method 459
Hodgen's method 460
How applied 461
§ 6. Fracture of the condyles 463
Symptoms—prognosis 463
Treatment 464
Compound fracture of the condyles 464
SECTION VI.—Fractures of the patella 464
Symptoms—prognosis—treatment 465
Dr. P. S. O'Reilly's patella splint applied 468
Prof. Hamilton's method 470
Compound fracture of patella 470
SECTION VII.—Fractures of the bones of the leg 470
Symptoms—prognosis—treatment 471
Clark's apparatus 472
Dr. Hodgen's " 476
Compound fractures of the leg 479
§ 1. Fracture of the fibula 480
Diagnosis—treatment 480
§ 2. Fracture of the tibia 481
Treatment 482
SECTION VIII.—Fractures of the tarsus 483
" " calcaneum 483
Prognosis—treatment 483

PAGE.
SECTION IX.—Fractures of the metatarsus and phalanges..... 484
Treatment..... 484
Compound fractures of leg and foot..... 485

PART XVIII.

OPERATIVE SURGERY.

CHAPTER I.

General remarks in regard to surgical operations..... 486
Qualifications of the surgeon..... 488
Circumstances influencing results of operations..... 489
Age—general condition of patient's health..... 489
Conditions of particular organs—temperament..... 490
Hygienic conditions..... 490
After an operation..... 491
Causes of death after an operation..... 492
Hemorrhage..... 494
Preparation of patients for an operation..... 496
Consent of patient..... 496
Preparatory treatment..... 497
Preliminary arrangements..... 498
Operation..... 499
Temperature of room—appliances..... 500
Anæsthesia..... 501
Incisions..... 502
Control and prevention of hemorrhage..... 503
Closure of wounds after operations..... 503
Arrest of hemorrhage..... 504

CHAPTER II.

OPERATIONS ON HEAD AND NECK.

SECTION I.—Trephining..... 508
Surgical anatomy—operation..... 509
Paracentesis capitis..... 511
SECTION II.—Operations upon the eye and its appendages..... 511
§ 1. Foreign bodies..... 512
§ 2. Operations upon the eyelids..... 513
Surgical anatomy..... 513
Removal of tumors..... 513
Ectropion..... 515
Epicanthis..... 516
Entropium..... 516
Ancyloblepharon..... 516
Symblepharon..... 517
Trichiasis..... 517
Causes—treatment..... 517
Lagophthalmos..... 518
Ptosis..... 518
§ 3. Operations upon the lachrymal apparatus..... 519
Surgical anatomy..... 519
Probing and division of the puncta and canaliculi..... 519
Operations upon the conjunctiva..... 521
Pterygium..... 521
Prolapse of the iris..... 522
Excurvation of the eyelids..... 522
§ 4. Operations upon the muscles..... 522
Strabismus, surgical anatomy..... 522

PAGE.

§ 5. Operations upon the eyeball 524
" for cataract 524
Surgical anatomy 524
Depression of cataract 524
Absorption or solution of cataract 525
Extraction of cataract 526
VonGræfe's method 527
Suction 528
Iridectomy 528
Iridodesis 529
Extirpation of the eyeball 530
Staphyloma 530
§ 6. Tumors in the orbit 531
Protrusion of the eyeball 531
Cancer within the orbit and within the eye 532
Treatment 534
Artificial eyes 534
§ 7. The ophthalmoscope 534
Mode of making an ophthalmoscopic examination 536
Healthy appearances 537
Morbid " 538
Hyperæmia of the disk 538
Atrophy of the disk 539
The retina 539
The choroid 540
Macula lutea, and vitreous humor 541
SECTION III.—Operations on the ear 542
Foreign substances in the ear 542
Accumulation of wax 543
Polypus 543
Treatment 544
Malformations of the auricle 545
Tumors " " 545
" " meatus 545
SECTION IV.—Plastic operations on the face 546
Rhinoplasty 546
Depression of the apex of the nose 548
" " ridge " " 549
Syme's method 549
Wood's " 549
Operation for depressed nose 549
Treatment 549
SECTION V.—Operations on the lips 550
Contraction or even closure of the buccal cavity 550
Hypertrophy of the lips 550
Tumors " " 550
Epithelioma 550
Treatment 551
Operation 551
Cheiloplasty 552
Harelip 553
Congenital fissure of the lower lip 556
SECTION VI.—Operations on parts within the nasal cavity 556
Surgical anatomy 556
Catheterism of the eustachian tube 557
Probing of the nasal duct 558
Plugging the posterior nares 558
Polypus of the nose 559
Lipoma 559
Imperforate nostril 560

PAGE.
SECTION VII.—Operations on the tongue..... 560
Removal of the tongue..... 560
Complete extirpation of the tongue..... 562
Ligation of the lingual artery..... 562
Tongue-tie..... 563
Tumors of the tongue..... 563
Erectile and vascular tumors..... 564
Fatty and glandular " 564
Malignant tumors of the tongue..... 564
Wounds of the tongue..... 564
SECTION VIII.—Operations within the mouth..... 565
Abscess of the gums..... 565
Lancing of the gums..... 565
Epulis..... 565
Treatment..... 566
Excision of the tonsils..... 566
Staphyloraphy..... 567
Operation..... 569
Uranoplasty..... 571
Elongation of the uvula..... 572
SECTION IX.—Operations on the jaws..... 573
Necrosis of the jaws..... 573
Abscess of the antrum..... 573
Cysts " " 574
Dropsy " " 574
Removal of the parotid gland..... 574
Surgical anatomy..... 575
Salivary fistula..... 575
Resection of the upper maxillary bone..... 575
Shock—hemorrhage..... 579
Suffocation from blood flowing into the air passages..... 580
Excision of the greater part of both upper jaws..... 580
Tumors of the lower jaw..... 581
Cystic, fibrous, fibro-cellular, cartilaginous, bony, myeloid and Encephaloid..... 581
Excision of the lower jaw..... 581
Removal of nearly two-thirds of the lower jaw for osteo-sarcoma 583
Anchylosis or closure of the jaws..... 587
SECTION X.—Operations on the neck..... 588
Apnea..... 588
Artificial respiration..... 588
1. Mouth to mouth inflation
2. Inflation with bellows
3. Inflation with oxygen gas
4. Compressing the chest and abdomen } 588
5. Silvester's method..... 589
6. Marshall Hall's "ready method"..... 589
To clear the throat..... 589
To excite respiration..... 589
To imitate respiration..... 589
To induce circulation and warmth..... 590
Bronchotomy..... 590
Laryngotomy..... 590
Tracheotomy..... 591
Operation of tracheotomy (plate)..... 591
Chief danger..... 592
Laryngo-tracheotomy..... 593
After-treatment of cases of bronchotomy..... 593
Choice of operation.....

PAGE.

§ 1. Injuries of the œsophagus ... 595
Wounds ... 595
Foreign bodies in the pharynx or œsophagus ... 595
Treatment ... 596
Œsophagotomy ... 596
Introduction of the stomach-pump ... 597
Tumors, warts, or polypi of the larynx ... 598
Operation of tracheotomy ... 598

CHAPTER III.

OPERATIONS ON THE THORAX.

SECTION I.—Amputation of the breast ... 600
Operation ... 600
SECTION II.—Paracentesis thoracis, or tapping the pleural cavity ... 602
Operation ... 602
Pneumothorax ... 602
" operation for ... 603
Hæmothorax ... 603
" operation for ... 603
Hydrothorax ... 603
" operation for ... 603
Empyema ... 603
" operation for ... 604
Hydrops pericardii ... 604
Wounds and contusions of the parietes ... 604
Penetrating wounds of the thorax ... 605
Hernia of the lung ... 605
The mammary gland in the male ... 605
SECTION III.—Wry neck ... 605
Operative treatment ... 606

CHAPTER IV.

OPERATIONS ON THE ABDOMEN.

SECTION I.—Paracentesis abdominis ... 607
Operation ... 607
SECTION II.—Abscess of the liver ... 608
SECTION III.—Gastrotomy ... 608
Operation ... 608
Foreign bodies in stomach, etc ... 609
SECTION IV.—Operation for the cure of artificial anus ... 610
Artificial anus ... 610
Operation ... 611
SECTION V.—Injuries of the bladder ... 612
Operative treatment ... 612
Wounds of the bladder ... 613
Foreign bodies in the urethra or bladder ... 613
Injuries of the rectum ... 614
Foreign bodies in the rectum ... 614

CHAPTER V.

HERNIA.

SECTION I.—Causes ... 615
Definition ... 615
General predisposing causes ... 615
Sex—occupation ... 615
Local or exciting causes ... 616
A patulous condition of the vaginal process of the peritoneum, or of its ventral orifice ... 616
Division ... 618

PAGE.
SECTION II.—Inguinal hernia..... 618
Definition—varieties—oblique..... 618
Direct—congenital—encysted..... 619
Diagnosis..... 620
Hydrocele of the cord..... 620
Vericocele, or cirsocele..... 620
Treatment—radical cure..... 621
SECTION III.—Femoral or crural hernia—definition..... 621
Diagnosis—psoas abscess—varix of the femoral vein..... 622
Bubo and other tumors of the groin..... 622
Treatment..... 623
SECTION IV.—Reducible hernia—symptoms—treatment..... 623
Palliative treatment—a truss..... 624
Radical cure of hernia..... 626
SECTION V.—Irreducible hernia—definition—causes..... 629
Consequences—treatment—radical cure..... 629
SECTION VI.—Strangulated hernia..... 630
Definition—causes—seat of stricture..... 630
Symptoms..... 631
Varieties—morbid appearances—treatment..... 632
The taxis..... 633
Chloroform—hot bath—tobacco enema—cold..... 634
Surgical anatomy of inguinal hernia..... 634
Operations for inguinal hernia..... 637
Postural treatment..... 638
Herniotomy..... 638
Operation for the radical cure of hernia..... 641
Surgical anatomy of femoral hernia..... 643
Operations for " " 643
Hermiotomy..... 644
Operation for radical cure..... 644
SECTION VII.—Colotomy, or the formation of an artificial anus..... 645
Surgical anatomy—operation..... 645
SECTION VIII.—Operations on the scrotum and penis..... 646
Ligation of the spermatic artery..... 646
Operation—varicocele..... 646
Operation for " 647
Castration..... 648
Operation of castration..... 648
Epithelioma of the scrotum..... 649
Encysted hydrocele (spermatocele)..... 649
Hydrocele of the spermatic cord..... 649
Hæmatocele—symptoms..... 650
Hydrocele of the tunica vaginalis..... 651
Tumors of the testis..... 652
Treatment..... 652
Congenital hydrocele..... 652
Abscess and hernia of the testicle..... 653
Hydrocele..... 653
Operation..... 654
Section of the frænum..... 654
Amputation of the penis—operation..... 655
Hypertrophy or elephantiasis of the scrotum..... 655
Operation..... 656
SECTION IX.—Malformations of the urethra..... 656
Partial occlusion or narrowing of the urethra..... 656
Complete occlusion..... 657
Epispadias—hypospadias..... 657
Urethral fistula—operation..... 658

PAGE.
Perineal fistula..... 658
Scrotal fistula—penile fistula—blind urinary fistula..... 659
Urethroplasty..... 659

CHAPTER VI.

URINARY CALCULUS.

SECTION I.—Varieties of calculus..... 660
Uric acid calculus—urates..... 661
Oxalate of lime calculus—phosphatic calculus..... 662
Mixed or fusible calculus..... 663
Cystine calculus—renal calculus..... 663
Vesical calculus..... 664
SECTION II.—Structure and physical characters of vesical calculi... 664
Number..... 664
Shape—size—hardness—weight..... 665
Situation..... 666
Causes of calculus—age—sex..... 666
Residence—other causes..... 667
Symptoms of vesical calculus—pain..... 667
Frequent and painful micturition..... 668
Prolapse of the rectum—diagnosis—prognosis..... 668
Sounding for stone..... 669
Lithotomy—surgical anatomy..... 670
Operation—instruments required..... 671
Bilateral method—operation..... 675
Median " " 675
Suprapubic " " 675
Surgical anatomy..... 675
Operation..... 676
Comparison of these operations..... 676
Lithotrity or crushing..... 676
Operation..... 678
Instrument crushing the stone (plate)..... 679
Stone in the female bladder..... 679
After-treatment..... 680
SECTION III.—Malformations and malpositions of the bladder..... 680
Extroversion or exstrophy of the bladder..... 680
Appearances..... 681
Treatment..... 682
Plastic operations..... 683
Malpositions—inversion of the bladder..... 685

CHAPTER VII.

OPERATIONS ON THE ANUS.

SECTION I.—Hemorrhoids..... 685
Causes of hemorrhoids..... 686
External piles..... 686
Internal piles..... 687
Bleeding from the rectum..... 688
Excision..... 690
Internal piles—operation of ligation..... 690
SECTION II.—Prolapsus ani..... 693
Prolapsus of the rectum..... 693
Excision of a V-shaped segment..... 693
Inflammation of the rectal pouches..... 693
SECTION III.—Fissures of the anus..... 694
Operation by section—operation by bursting..... 694
SECTION IV.—Fistula in ano..... 695
Causes—varieties—symptoms..... 695

PAGE.
Diagnosis ... 696
Operation ... 697
Partial occlusion of the anus ... 698
Complete " " " ... 698
Imperforate anus ... 698
Occlusion of the rectum ... 699
Recto-vesical and recto-urethral fistulæ ... 699
SECTION V.—Strictures and tumors of the rectum and anus ... 700
Simple or fibrous stricture ... 700
Symptoms—diagnosis ... 701
Treatment ... 702
Non-malignant tumors of the rectum ... 705
Rectal polypus—sessile growths ... 705

CHAPTER VIII.

OPERATIONS ON THE FEMALE GENERATIVE ORGANS.

SECTION I.—Lacerated perineum ... 706
SECTION II.—Vesico-vaginal fistula—treatment ... 709
Operations for urinary vaginal fistula ... 709
1. Position of the patient ... 710
2. Exposure of the fistula ... 710
3. Paring the edges ... 710
4. Introduction of the sutures ... 711
5. Fastening of the sutures ... 712
6. The catheter ... 713
7. Removal of the sutures ... 713
Modifications required in special cases ... 713
Hypertrophy of the labia ... 714
Cystic tumors of the labia ... 714
Imperforate vagina ... 714
Imperforate hymen ... 714
Absence of the uterus and ovaries ... 715
Hypertrophy of the clitoris ... 715
Removal of the clitoris ... 715
Tumors of various kinds ... 715
Prolapsus ... 716
Treatment ... 718
Various displacements ... 718
Tumors of the uterus—polypi—operative treatment ... 719
Cauliflower excrescence ... 720
Malignant affections of the uterus—treatment ... 720
Vaginismus ... 720
SECTION III.—Ovarian tumors—treatment ... 721
1st. Medical means ... 722
2nd. Tapping ... 722
3d. Tapping, conjoined with other means ... 722
4th. Injection of tincture of iodine ... 723
Differential diagnosis ... 723
Fibro-muscular tumors of the uterus ... 723
Ascites ... 723
Cystic disease of the broad ligament ... 724
Solid tumors of the ovary ... 725
Ovariotomy ... 725
Operation of ovariotomy ... 727
After-treatment ... 730
Double ovariotomy ... 733
Extirpation of both ovaries and of the uterus ... 733
Cæsarian section ... 733
Nephrotomy for renal calculus ... 734

PAGE.
Extirpation of the kidney ... 784
Extirpation of the spleen ... 785
Treatment of abdominal abscesses ... 785
Hepatic abscess—biliary abscess—splenic abscess ... 785
Perinephritic abscess ... 786

CHAPTER IX.

SECTION I.—Deformities of the arm, hand and fingers ... 786
Contraction of the arm ... 787
Contraction of the forearm and hand ... 787
Club hand ... 787
Contractions of the fingers ... 788
SECTION II.—Deformity of the lower extremity ... 788
Contraction of the hip ... 788
Knock-knee or genu-valgum ... 788
Outward bowing of the knee or genu-extrorsum ... 789
Contraction of the knee ... 789
Division of the hamstring tendons ... 740
Club-foot talipes ... 740
Talipes equinus—cause ... 741
Treatment ... 742
Talipes varus ... 742
Talipes calcaneus ... 744
Talipes valgus or flat or splay-foot ... 745
Weak ankles ... 745
Treatment of club-foot without dividing tendons ... 745
Contraction of a toe ... 746

CHAPTER X.

RESECTIONS OR EXCISIONS OF THE JOINTS AND BONES.

SECTION I.—General considerations in resections ... 746
Indications for and contra-indications to resection in general ... 747
Process of repair after resection ... 748
Operation ... 750
SECTION II.—Special excisions—scapula ... 750
SECTION III.—Resection of the joints of the upper extremity ... 752
Resection of the shoulder-joint ... 752
Resection of the humerus ... 754
Resection of the elbow—operation ... 754
Resection of the wrist joint ... 755
Resection of the hand ... 756
SECTION IV.—Resections of the joints of the lower extremity ... 756
Resections of the hip ... 756
Surgical anatomy—operation ... 757
Resection of the femur in its continuity ... 759
Resection of the knee joint ... 759
Operation ... 760
Resection of the bones of the leg ... 761
Resection of the ankle ... 761
Resection of the foot ... 762
Resection of the astragalus ... 762
SECTION V.—Resections in the continuity of bones ... 762
Subperiosteal resections ... 764
Gouging ... 765

CHAPTER XI.

AMPUTATIONS.

SECTION I.—History and general considerations ... 765
Conditions requiring amputation ... 767

PAGE.
When a limb is torn off.... 767
Mortification.... 767
Compound fractures and luxations.... 769
Morbid growths—tetanus 770
Instruments required—tourniquet.... 770
Amputating knives.... 773
SECTION II.—Modes of amputating.... 774
Circular method.... 774
Flap method.... 776
Oval method.... 778
Modified circular operation.... 778
Teale's method by rectangular flaps.... 778
General rules.... 779
Appliances—dressings.... 780
SECTION III.—Amputations of the upper extremity.... 782
Amputation (disarticulation) at the shoulder joint.... 782
Operation—Larrey's method.... 783
Dupuytren's method.... 784
Amputation above the shoulder.... 785
Amputation of the arm.... 785
Amputation through the arm.... 785
Amputation (disarticulation) at the elbow.... 786
Surgical anatomy.... 786
Operation—circular—flap.... 787
Amputation through the forearm.... 788
Circular method—flap method 788
Amputation (disarticulation) at the wrist joint.... 789
Surgical anatomy.... 789
Operation—circular method—flap method.... 790
Amputation (disarticulation) of the metacarpus.... 790
Operation.... 790
Disarticulation of the thumb.... 791
Disarticulation of all the fingers—operation.... 792
Amputation through the metacarpus.... 792
Amputation of the little finger.... 792
Amputation of one finger.... 792
Double flap method—oval method.... 792
Disarticulation of phalanges—operation.... 793
SECTION IV.—Amputations in the lower extremity.... 794
Amputations at hip joint.... 794
Surgical anatomy—operation.... 796
Amputation of the thigh.... 798
Circular amputation.... 798
Teale's rectangular method.... 800
Amputation at knee joint.... 800
Surgical anatomy—operation.... 801
Amputation of the leg.... 802
Operation.... 803
Amputation at the ankle.... 804
Operation—Chopart's—Pirogoff's.... 805
Syme's.... 807
Amputation of all the metatarsal bones.... 807
Amputation of metatarsal bones of great toe.... 808
Amputation of the toes.... 809
Amputations, simultaneous, sychronous or consecutive.... 809
Dressing of the stump.... 809
Structure of a stump.... 811
Affections of stumps.... 812
Periostitis—osteitis—osteo-myelitis.... 814

PAGE.
Mortality after amputations..... 814
" " " tables of..... 816
Causes of death after amputation..... 820

CHAPTER XII.

MINOR OPERATIONS.

SECTION I.—Nævus, operation for..... 822
SECTION II.—Varicose veins, operations for..... 825
Hypodermic injection..... 825
SECTION III.—Vaccination..... 826
SECTION IV.—Opening of abscesses and sinuses..... 827
SECTION V.—Transfusion of blood..... 829
Operation for..... 829
SECTION VI.—Diseases of the areolar tissue..... 830
Cellulitis..... 830
Elephantiasis arabum..... 830
" græcorum..... 830
Barbadoes leg—treatment..... 831
SECTION VII.—Diseases of lymphatic system..... 832
Angeioleucitis—treatment of..... 832
Adenitis—treatment of..... 833
Varicose lymphatics..... 834
Lupus exedens..... 834
Lupus non-exedens..... 834
Lupous ulcer—treatment..... 835
Rodent ulcer..... 836
Injuries of the lymphatics..... 837
Injuries of the bursæ..... 837
Hypertrophy of toe nail..... 837
Keloid..... 837
SECTION VIII.—Injuries of veins..... 838
Entrance of air into veins..... 839
Treatment of..... 841
SECTION IX.—Injuries of arteries..... 842
Constitutional effects of hemorrhage..... 845
Periodic hemorrhage..... 846
Hemorrhagic diathesis..... 846
Treatment of..... 847
SECTION X.—Substitutes for the natural limb..... 848

PART X.

INJURIES AND DISEASES OF JOINTS.

THE diseases and injuries affecting the articulations, without reference to the subject of dislocations, sub-luxations, &c., which will be referred to hereafter, under their appropriate title, comprise *sprains*, *wounds of joints*, *arthritis*, and the various complications arising therefrom, *morbus coxarius*, *false cartilages* and *anchylosis*, each of which will be presented to the student separately and in detail.

CHAPTER I.

SPRAINS.

A **Sprain**, or **strain**, is an injury of the joint, in which there is more or less contusion, stretching, or laceration of the ligaments and surrounding structures, without displacement of the articulating surfaces and accompanied with subsequent inflammatory action. When occurring in subjects of a rheumatic or scrofulous diathesis, the consequent symptoms are often of a persistent and serious character. Sprains differ from luxations, not only in the diminished amount of injury done the ligaments of the joint, but in not being accompanied by any displacement of the articulating surfaces of the bones that enter into the formation of the joint.

Seat.—The articulations most prone to this injury are the ginglymoid, as the knee, elbow, fingers, wrist, foot and ankle, owing to the circumstance that these joints are surrounded by short, firm and unyielding ligaments, while their normal motion being limited by flexion and extension, renders a severe stretching or rupture extremely liable under certain circumstances, by a violent or sudden twist or tension. The orbicular, or ball and socket joints, as those of the hip and shoulder, in consequence of their greater freedom of motion, and the more yielding nature of their ligaments, are less exposed to this accident, though, occasionally, extreme abduction of the limbs is quite sufficient to produce serious injury of this nature.

Etiology.—The causes of sprain may be either mechanical violence, as a blow, fall, or severe twisting of the articular surfaces upon each other; sudden and violent muscular action, as leaping, lifting or forcibly hurling a weight; which causes may also be sufficiently energetic to complicate the accident with luxation or fracture. Thus, the radius or fibula, offering quite a marked resistance to the lateral movement of their respective articulations, sometimes become fractured in sprains of the wrist and ankle, while, also, one or more of the carpal or tarsal bones may undergo displacement.

Predisposing causes of sprains are met with in persons of a rheumatic or scrofulous habit, in consequence of a morbid condition of the ligaments having been produced by previous inflammatory action; also, in those naturally "loose-jointed" and "flat-footed" persons, in whom exist an abnormal condition of the articular surfaces, as well as in those persons who are affected with club-foot or other deformity, in which the articulating surfaces of the bones are not in their proper relative position.

In every case of severe sprain there exists more or less injury inflicted upon the parts in immediate relation with the affected joint. The muscles and tendons undergo more or less violent tension, and sometimes even slight laceration. The nerves and vessels are stretched, and the integuments and subjacent tissues often show evidences of severe injury by their bruised and discolored condition. In cases where the injury inflicted has been sudden and severe, the articulating surfaces, being violently brought together, suffer

a considerable degree of contusion by the shock, thus greatly aggravating the case.

Symptoms—The symptoms indicative of sprain vary according to the severity and extent of the injury. In the slighter forms the degree of pain corresponds with the amount of laceration and contusion of the nerve filaments and branches supplying the parts —the pain is soon followed by evidences of inflammatory excitement, depending upon the violence and extent of the injury. In slight cases these phenomena gradually subside, and in twenty-four or thirty-six hours, under the treatment of perfect rest and appropriate internal and local agents, the joint regains its strength and functions, all evidence of trouble having entirely disappeared.

In *severe* sprains, however, this favorable termination does not so readily follow; the pain may be so severe at the moment as to cause faintness or sickness, and is referable to the affected joint; there is impairment or total loss of motion or control over the injured part; heat, tenderness and swelling of the structures implicated rapidly supervene, while there is often more or less discoloration of the parts in consequence of extravasation of blood into the cellular tissue. After the lapse of a few hours, serous effusions take place into the *bursa mucosa* and into the cavity of the articulation, followed by induration and a sense of crepitation when manipulating the joint. The pain, which is excessive from the first, often produces a marked depressing influence upon the entire nervous system. In rare cases the bursæ become so highly inflamed as to terminate in suppuration and sloughing.

A *severe* sprain is in fact often a much more serious accident, as regards its secondary effects, than a dislocation or fracture near a joint. Convalescence in such cases is usually tedious, the articulation remaining weak and tender for several months and sometimes for years. Indeed, it not infrequently happens especially in neglected, or ill-treated cases, and sometimes, says Gross, "even when every possible precaution has been adopted, that the articulation not only continues to be weak and uncomfortable for a long time, but that the corresponding limb becomes cold, wasted, flabby and exquisitely sensitive, perhaps also, the seat of neuralgic pain, subject to severe exacerbation whenever exercise is attempted or there is a change in the weather." It occasionally

happens that in severe or badly treated cases, the movements of the joint are never regained. Conjoined with this local disorder, the system of the patient sympathises and he becomes extremely nervous, irritable and dyspeptic, even bordering upon hypochondryasis. The probable cause of all this, is attributed to "the shock or concussion sustained by the nerves of the affected part at the time of injury, the effect thus produced exercising a pernicious influence upon the nutritive functions of the whole limb, and indirectly upon the well-being of the general system, especially the great nervous and ganglionic centres." The only accident with which a sprain may be confounded, is dislocation, but from this it may be readily distinguished by the absence of all those signs attended by a luxation of the joint.

Diagnosis.—In examining a patient with sprain, care must be exercised that the surgeon do not confound it with *dislocation*, or a *fracture near the joint*, two conditions resembling that of sprain, especially when occurring in the wrist or ankle joint. Thus, a sprain of the wrist accompanied with effusion into the bursae of the flexor tendons producing a tumor on the palmar surface of this articulation, with pain and loss of motion, might readily be mistaken for Barton's fracture and vice versa. Careful manual examination, by making careful compression upon the surfaces of the joint, by flexion and extension; adduction and abduction; twisting internally and externally; a comparison of the length of the two limbs; the patient's control of the joint, &c., are the only means we have to ascertain the true condition of the articulation. The cartilage of joints in a normal state is not sensitive; it possesses no nerves, except those of nutrition; any pain therefore remaining in the articulation is evidence of an abnormal condition of these surfaces; therefore, whenever pain can be produced by pressure, even in the slightest degree, it will not be safe to discharge the patient as cured, or well, so long as this state of things exists. The blood extravasated beneath the cartilage after injury to the joint, remains there as a foreign body, engenders inflammation whenever pressed upon by the articulating surfaces and, if not absorbed, serious disease of the joint. By continued pressure of the joint surfaces together, the mischief slowly but persistently increases,

and if there exist any constitutional trouble, its progress is correspondingly more rapid. In the examination of a sprain, therefore, the surgeon should not be deterred by the pain produced during the manipulation, from making a thorough exploration of the condition of the parts, and if the patient is unable to endure the suffering, etherization should be promptly used, as it is of the utmost importance that the precise nature of the injury should be understood. This is especially recommended in sprains of the ankle and wrist joints, to distinguish the former from a fracture of the lower fifth of the fibula, and the latter from Barton's fracture.

Treatment.—In the treatment of sprains two leading indications present themselves in every case, whether slight or severe; the first is to limit and control inflammation; and the second, to restore the joint if possible, to its primitive functions. The degree and severity of the injury done, will regulate the character of the treatment to be pursued; as soon as the nature of the injury is determined, the limb should be carefully bandaged and placed perfectly at rest, either by extending it carefully upon a hair pillow, or by the use of appropriate splints, so as to insure certain quietude. To prevent the development of inflammatory excitement, the whole limb should be immersed in warm water, retaining it there fifteen or twenty minutes, then withdraw it and cover the joint involved, with a warm saturated lotion of *Arnica*, *Hypericum*, *Rhus tox.*, or *Ruta grav.*, as the nature of the injury demands, maintaining the limb at perfect rest during treatment.

Instead of removing the cloths as soon as they become cool, it is better to squeeze the lotion upon them as hot as can be borne, from a sponge, and as often as occasion may require. I generally prefer the *Ruta* lotion to any other in the *deeper* seated joints, and *Hypericum* or *Rhus tox.* application in the superficial, applied by means of flannel, arranged in six or eight layers, and covered with a superficial layer of oiled silk, to confine heat and moisture. After twenty-four hours, if the pain has materially abated, the heat and moisture of the cloths may be gradually and imperceptibly diminished, and, in twenty-four hours thereafter, gentle use of the joint may be attempted. If motion produces an aggravation of pain, it should be at once dis-

continued, and not attempted again until movement of the joint is *painless.*

In sprains of the ankle joint, Prof. Gross says, he has "frequently seen the happiest effects produced by protracted immersion of the limb in hot salt water." Under the treatment recommended, sprains of the less severe type are cured without the use of any internal treatment, and frequently very promptly and satisfactorily. In the *severe* and more common variety of sprain, in addition to the medication already referred to, the injured limb should be carefully bandaged, and placed perfectly at rest, in an easy elevated position, by means of carefully adjusted splints, and be retained in this manner, so as to insure more certain quietude. An excellent plan is to place the limb upon a hair pillow, covered with a strip of oiled silk, to prevent accumulation of the secretions, and to insure cleanliness; and apply the fomentations previously advised. When the pain and swelling is unusually severe, and there exists more or less constitutional irritation, with febrile reaction, *Aconite* lotion may be substituted for the *Arnica*, *Ruta grav.* or *Rhus.* applications, and, at the same time, be given internally. *Arnica*, *Bryonia*, *Conium* or *Rhus*, are remedies of value after the subsidence of the more active symptoms. In congestion of the joint, following sprain, *Aconite* is a much more serviceable remedy than *Arnica*, as it tends both to check the traumatic fever, as well as to subdue the inflammation and scatter the congestion going on within the joint. In sprains of a severe type, I have frequently used *Aconite* internally, and *Rhus* or *Ruta* as a lotion to the affected part, with the most satisfactory results. The violent strain, which the nervous system, in the neighborhood of the injury, undergoes, superinduces inflammatory excitement to a greater or less extent, which invariably requires the administration, internally, of *Aconite*, and externally, of *Hypericum.* If obstinate constipation occurs during treatment, which is very apt to ensue, the bowels must be relieved either by an enema, or a dose of *Nux vomica*, *Opium*, *Alumina*, *Platina*, *Podophylin*, or in case of their inaction, by the administration of a *laxative* remedy. Throughout the conduct of the case the bandage should be carefully applied and watched; as when properly and evenly adjusted, support is afforded to the injured joint, swelling and

spasm controlled, and absorption of effused fluids prevented; but let it become loose, or be unevenly applied, producing constriction of the limb at one point, and irritating the extremities by hanging loosely at another, much more harm than good will ensue from its use. After subsidence of the more urgent symptoms, stimulating lotions by the hand, in lieu of fomentations, which should be gradually withdrawn, will be found of great service in assisting the removal of effused fluids, and promoting the gradual restoration of the functions of the joint. At first they should be applied once or twice a day, cautiously increasing the frequency as pain and tenderness abate, using the precaution to keep the limb covered by flannel cloths saturated with the remedy employed. A weak solution of the tincture of *iodine*, in the proportion of one to three of alcohol, I have found exceedingly beneficial in restoring impaired functions of joints. *Mercurial* inunctions, *Camphor*, *Ammonia* and *Turpentine* embrocations have been found of exceedingly great value after the subsidence of acute symptoms. Towards the close of treatment, the daily application of the roller must be kept up, for, beneficial as it is in the first stage, it is even more so during the secondary stage, for the purpose of giving support and tone to the already weakened limb. At a later period in the treatment, or when the disease has assumed a chronic form, producing subacute inflammation, or thickening of the tissues of the joint, the first attempt at movement of the limb is sometimes quite difficult, and attended with more or less pain. In this condition, along with the internal treatment great benefit will be derived from magnetic baths, magnetism, medicated shower-bath or cold douches; the parts, immediately afterwards, to be well rubbed with the bare hand or a piece of coarse flannel. In those cases where a more powerful impression is desirable, the use of the hot and cold douche, in rapid alternation, has been highly recommended. Prof. Gross has received marked benefit from the daily application of fish-brine, which seems, he says, "to possess other properties than those simply dependent upon the presence of saline matter, though it is impossible to define their character."

Painting the surface of the skin over the joint daily with *tincture of iodine*, I have freqnently found a remedy of consider-

able value in chronic cases or when the more active symptoms have been controlled.

As soon as the disease has reached that stage, when passive motion does not kindle anew symptoms of acute inflammation, the joint must be gently exercised, and the patient compelled to move about in the open air. It must be remembered that motion, as Prof. Gross remarks, "is the proper stimulus of a joint, as air is of the lungs, or food of the stomach; and when, after an injury, it is long neglected, serious consequences are sure to arise."

During this time the general health of the patient must be attended to; exercise in the open air insisted upon; dietetic and hygienic regulations enforced, and either one of the following remedies taken internally: *Agnus cast.*, *Arnica*, *Ammonia carb.*, *Hypericum*, *Bryonia*, *Kali jod.*, *Pulsatilla*, *Rhus*, *Rumex*, *Ruta grav.*, *Nux vomica*, and *Sulphur*. Of these remedies, *Arnica*, *Hypericum*, *Kali jod.*, *Rhus tox.*, and *Ruta* are the most valuable, and, under ordinary circumstances, fulfill all indications of treatment.

Arnica.—In the case of a laborer, who sprained his right shoulder very severely while at work, this remedy was given, and in one week the pains in the shoulder had ceased, improvement went on uninterruptedly, and in three weeks the patient was discharged cured.*

Rhus tox.—In a sprain involving the middle joint of the thumb, in a strong, athletic, and vigorous person, the parts being exquisitely tender and painful to the touch, *Rhus tox.*, 30th, was administered, and the patient was cured in three weeks. *Hypericum* is a remedy of great value in contusion and laceration of nerve fibres. See its action, page 618, vol. 1.

Apis mel.—In the case of a young man, aged twenty, of a bilious, sanguine temperament, his left knee was badly sprained from being thrown from a horse; two doses of *Apis* are reported to have cured the patient in two weeks.†

In those cases of sprain involving the periosteum, *Ruta* is the best remedy according to my experience, especially if the pains

* British Journal of Homœopathy, vol. 23, page 185.

† New York State Transactions, vol. 2, page 251.

are *aggravated during rest and relieved by motion; Rhus tox.* is better adapted to injuries affecting the ligaments and fibrous tissues of the joints, the symptoms being *increased during rest. Stillingia* is serviceable when the disease attacks the periosteum, with a scrofulous condition of the bones, and *Arnica* is more appropriate when the muscular and soft structures become implicated in the diseased action. *Phytolacca* has afforded much relief in a few cases of severe sprains after the more acute symptoms had been controlled by the treatment above recommended.

Rupture of a muscle, whether occurring from external violence, or from the intensity of its own contraction, occurs almost always at the point of origin of the tendon, and requires relaxation by position, so as to approximate its divided ends, and maintain the limb for a sufficient length of time, until proper union takes place. The internal treatment consists in the administration of *Arnica* or *Rhus* which are particularly adapted to sprains occurring in musculo tendonous parts, with swelling and great pain, they may be used both locally and internally; the external use of *Rhus* being graduated in strength to meet the sensitiveness of the skin of the patient. *Bryonia* is useful in sprains where the pains are darting and aggravated by motion, or when the pains are tense, drawing and tearing and do not bear movement and especially when the muscular tissues are implicated. *Ammonia carb.* is useful in sprains attended with fatigue and weakness in the limbs, with stinging, tearing and drawing in the joints as from shortening of the tendons—pains more on the right than the left side, with great sensitiveness to cold and open air, especially evenings. *Lycop.*, *Petrol.* and *Ruta* are appropriate when the more acute symptoms have passed away and the disease begins to assume a chronic character.

Sepia is recommended by Dr. Goullen for many troublesome constitutional symptoms that may supervene upon a sprain.

If the patient suffers from the constitutional effects of any pre-existing disease, the remedies required to meet this defect must be given intercurrently with the medicine specificially indicated for the sprain. I have treated several cases of sprain occurring in syphilitic and strumous constitutions which improved rapidly, and

permanently, when constitutional remedies were employed to overcome these dyscrasias, at the same time the treatment was adapted to the injured limb.

Mechanical Treatment.—Instruments, well adapted to these injuries as well as all others affecting the joints, whether from violence or the result of disease, and especially in those neglected or persistent cases, where the muscles have became involved and by their contraction continually press the diseased articulations together, thus increasing the disease and deformity, have been devised by Prof. L. A. Sayre, of New York. One of these instruments, for the purpose of making proper extension, consists of a foot piece of firm steel or hard rubber plate made to fit the sole of the foot; there is at the heel, says Sayre, "a hinge joint and attached to it a rod, slightly curved at the bottom and extending up the back of the leg to near the knee—over the instep is a stirrup-like arch, with a hinge joint above, from which another rod mounts up in front of the leg of equal length with the hinder one. These rods have a male and female screw or ratchet and cog, for purposes of extension which are connected above by a firm band of sheeting, with a hinge on one side and lock on the other, somewhat like a dog-collar—Fig. 222. This instrument is applied by means of firm adhesive strips, one inch in width and long enough to reach from the ankle to the middle of the patella and made to completely encircle the limb as is shown in Fig. 223.

Fig. 222.

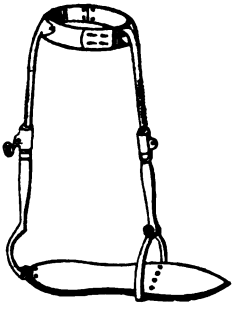
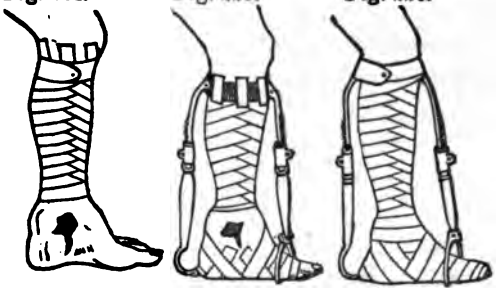


Fig. 223.

The plaster is secured in this position to within an inch or two of its upper extremity by a well adjusted roller, mounting from the ankle upwards to the base of the knee joint as is seen in Fig. 224. The instrument is then adapted to the limb, and fixed firmly, all being secured and the foot held in situ by a number of strips of adhesive plaster, as is shown in Fig. 225, carefully applying a roller over the ends of the plaster to

Fig. 224. Fig. 225. Fig. 226.



prevent their slipping, taking care to turn the upper extremities over the collar, which has been previously locked just tight enough to be comfortable and thus secured by a turn or two of the bandage as is shown in Fig. 226.

In this condition of the limb, the foot assumes the appearance of talipes equinus through contraction of the gastrocnemii and soleus muscles, and in some cases, it may be necessary to divide the tendo achillis before the foot can be brought into its proper position, especially in those persons where these muscles are organically contracted—usually, however, the foot can be adjusted by the use of this instrument alone, and the patient is able to bear his weight upon the diseased limb without causing pain, the instrument taking off the pressure from the diseased joint. If general œdema takes place, the disease increasing in severity and especially if the parts have been too freely poulticed, as is most apt to occur, there will be observed a bluish livid appearance of the part, denoting a passive congestion of the capillary circulation. There is probably no system of treatment so pernicious in its effects upon a diseased articulation, no matter where it be situated, as the *continued application of a poultice*. In the more advanced stages of joint disease, the circulation is feeble and slow, and the heat and moisture inherent in poultices, entices an increased flow of blood to the part, engorging the capillaries to such an extent as to paralyze their power of action and having no power to pass the current along, œdema and final disintegration of the parts is the inevitable result. To overcome such a condition and to assist the overburdened capillaries, pressure upon the hypertrophied cellular tissue about the joint should be made, and the limb placed in a horizontal position—compression may be best made by the use of a large coarse sponge, the water having been pressed out and the sponge bound tightly

and firmly about the joint; then the sponge, absorbing the medicated lotions that are poured upon it, increases its size and a constant and uniform pressure is kept up, relieving the œdematous condition and livid appearance of the joint.

If the disease has still further advanced and pus is contained within the articulation, as may be known by the concomitant symptoms, such as fever, loss of appetite, paleness, emaciation, irregular chills, etc., a free opening should be made in the most dependent part of the joint, so as to permit a thorough drainage of the contents, and which should be kept up so long as any matter forms within the joint. If there exists *caries* of the bone, a probe, armed with oakum, passed through the joint from side to side and forming a seton, is the most thorough and perfect manner of effecting complete drainage of the fluids within the articulation—as the seton is changed from time to time, small particles of bone will frequently pass out with it and the opening will continue to diminish in size as the disease abates; the thin, sanious, and watery discharge, will under the use of this agent and the constitutional remedies previously given, yield to a thick, laudable and cream-colored pus—as this takes place the size of the seaton should be gradually diminished to a single thread and finally removed altogether—care should be taken that the opening be not closed until every particle of matter is removed, as a few drops only have been known to produce serious mischief. At this period of the disease it is a question, still mooted among surgeons, whether the joint should be permitted to become anchylosed, or an attempt be made to retain mobility, by passive and continual movement of the limb. Dr. Sayre, instances the case of a young lady, in whom the ankle joint had been setoned for ten or twelve years, small pieces of bone having been thrown out, yet the *mobility of the joint is now perfect*—a result so desirable, calls for the most careful and assiduous attention of the surgeon, particularly so as frequent cases of this character have occurred, in which almost perfect motion of the joint has been preserved. Slight sprains are more liable to lapse into this condition of disease than those of a more severe character, owing to inattention of the patient to the injury in the first stage, in consequence of its slightness and

the neglect of appropriate treatment at the beginning of the accident.

This mechanical treatment is equally serviceable in all cases of severe injury affecting the joints, whether by injury, wound, or as the result of disease.

The author had under this method of treatment a person who sustained a gunshot wound through the ankle joint during the late war of the rebellion, and which has been constantly discharging pus and pieces of bone since that time, but is now entirely healed, with full motion of the joint.

In several other cases involving injuries to the ankle joint, with more or less impairment of the function of locomotion, this treatment as recommended by Professor Sayre has proved exceedingly efficacious, in each instance the patient being benefitted beyond my most sanguine expectations.

CHAPTER II.

WOUNDS OF JOINTS.

Wounds of Joints, however insignificant they may be apparently, require the closest attention at the hands of the surgeon, as, sooner or later, the most serious consequences are liable to supervene. The same variety of wounds occur here as in other parts of the body, and are to be regarded serious, in proportion to their extent, the size of the joint injured, and the kind of wound inflicted.

Lacerated and gunshot wounds are particularly dangerous, frequently terminating in complete destruction of the articulation, if not also inducing the death of the patient. If the wound be large, with fracture of the articular extremities of the bones, one or both of these consequences will inevitably follow. The

most astonishing recoveries, however, are sometimes met with in wounds of these parts, while at the same time it is no uncommon occurrence for the most trivial incised or punctured wound to terminate in partial or complete anchylosis. The source of danger in each particular case arises from the excessive inflammatory action that is set up in the joint (*traumatic arthritis*).

Symptoms.—The symptoms following severe wounds of the articulation are very marked. There will be an immediate escape of synovial fluid, with intense pain, tension and swelling of the part, together with great constitutional disturbance, the patient becoming deadly pale, faint and helpless. In the course of twelve or twenty-four hours rigors supervene, followed by high fever, delirium, gastric derangement, extreme restlessness and excessive thirst. In the meantime the local symptoms increase, the heat, pain and swelling become intense, the limb assuming in the course of forty-eight hours, not later than the fourth day, an erysipelatous blush; the synovial fluid increases in quantity, gradually becoming purulent; ulcers, form often discharging a highly fetid matter; the ligaments become yielding and softened; the bones are rendered carious, the patient at this time suffering with frequent rigors, fever, and copious, debilitating sweats.

The severity of the local symptoms is evidently due to the extent and depth of the synovial membrane, which rapidly suppurates, the pus being confined amid dense, unyielding tissues, which prevent its free exit. It appears that the suppuration is occasioned by the admission of air into the joint, as in the most severe subcutaneous lacerations, occurring in luxations and fractures, suppuration rarely occurs. The character of the pus is also dependent upon its contact with the air, becoming acrid and putrescent, thus greatly adding to the local irritation.

Traumatic arthritis differs from the *idiopathic* variety in this circumstance, viz: that in the former the inflammation is exhibited primarily in the synovial membrane, the cartilages being implicated secondarily, the articular extremities of the bones not participating in the diseased action; whereas, in the *idiopathic* form the osseous structures are first affected, the cartilages and synovial membrane suffering subsequently.

Complications.—The affections particularly liable to become complicated with wounds of the joints, include erysipelas, pyemia, and tetanus.

Erysipelas, which indicates a low and vitiated state of the system, usually occurs within the first thirty-six hours; first manifesting itself at the seat of injury thence spreading more or less extensively over the neighboring structures. Neither the size nor character of the wound, however, exercises any very marked influence in determining the time or severity of the attack, while its peculiar type will depend on the condition of the constitution at the time of the injury. The varieties of this affection together with its characteristic symptoms and treatment are given on page 357, vol. 1, et sequitur.

Pyemia, resulting most frequently from lacerated, contused, and gunshot wounds, is a very dangerous complication, usually appearing in connection with abscesses in some of the viscera, as the lungs, liver, kidneys or spleen.

The constitutional symptoms are always severe, there being great depression of the general system, indicated by low delirium, brown tongue, pulse small and fluttering, with profuse sweats.

The local symptoms are also intensified, the pain becoming exceedingly severe, the swelling greatly increases, the discharges abundant, being thin, sanious, and highly fetid.

Tetanus occurs much less frequently than either of the above affections, being met with more commonly in military than in civil practice. It may supervene at any period subsequent to the time of injury, even after the wound has become completely closed, though it usually exhibits itself from four days to two weeks after the accident. The most reliable premonitory symptoms are a feeling of lassitude, restlessness, uneasiness in the muscles and stiffness about the lower jaw; the wound, if open, putting on an unhealthy appearance. Exposure to cold, wet, or draughts of air, with improper nourishment are its principal predisposing causes.

Treatment.—In the treatment of wounded joints, the first thing to be ascertained is the extent and severity of the injury, and then to determine whether the lacerated limb can be saved or not. If the articulation is small, there is no doubt of complete

success in this direction; but, if one of the large joints be involved, the danger is correspondingly increased. If the wound is simply an *incised* one, though one of the larger joints is opened, no surgeon will be justified in resorting to amputation. The proper course, under these circumstances, will be to approximate the lips of the wound by strips of adhesive plaster, to prevent the admission of air into the joint, and cover the whole articulation with a compress saturated in *Calendula*, *Hypericum*, *Ruta* or *Staphysagria* lotions, and bind it down with a roller, extending from the distal part of the limb upwards. A plan highly recommended by Prof. Gross is, before applying the dressings, to bring the lips of the wound together with *Collodion* carefully applied, so that there shall not be the least possible risk of the admission of air, which entering the joint, is extremely liable to cause rapid decomposition of the inflammatory products. If the wound is large, and the joint is extensively laid open, with much contusion and laceration, the danger becomes exceedingly great. In this case, all extraneous matter must be carefully removed from the wound by the use of the fingers and forceps, search must be made for any splinters of bone that may be produced by the injury and, if possible, extracted. If the foreign matter be deeply imbedded into the joint, and the wound is disproportionately small, causing irritation and pain in an attempt to extract it, the safest plan is to let it alone. This is particularly applicable to balls or other missiles lying deeply imbedded in the articulation. But if, on the contrary, the projectile lies loose in the cavity of the joint, it should be removed at once, and so with reference to all other foreign matters that are readily accessible. All officious manipulation, whether by the finger, probe or other instrument, must be scrupulously avoided, as the already inflamed tissues of the joint, says Prof. Gross, "are eminently intolerant and resentful of such manipulation, however gently conducted, bearing, in this respect, the greatest possible resemblance to the peritoneum, which, as every one knows, can hardly be touched without becoming inflamed." If the bones composing the joint are comminuted, partial resection of the articular extremity, and removal of the splinters may, with propriety, be practiced, more particularly if the constitution is vigorous, the patient young, and the soft parts not too extensively dam-

aged. If, on the other hand, the patient is aged and health broken, amputation is the only resource. This is more especially the case in those severe injuries where the knee joint is the articulation thus injured; amputation is more imperatively demanded in extensive lacerations and comminutions of this joint than any other in the body.

In conjunction with the dressing employed, it is of paramount importance that the limb be placed in an easy and elevated position, all motion being entirely prevented by the use of splints and other suitable means. If the inflammation is severe, *Aconite* internally will be demanded, as well as its constant application to the diseased parts, until inflammatory action has been subdued, when *Hypericum*, or *Ruta grav.* lotions may be substituted, and *Arsenicum*, *Bryonia*, *Belladonna*, *Mercurius*, *Phosphorus*, *Hepar*, *Rhus tox.*, *Silicea*, *China* and *Iodine*, given internally, according to circumstances. When the suppurative stage arrives and matter has formed within the joint, without an adequate outlet, a valve-like incision should be made to procure an early discharge of the contained pus. When the quantity of pus is very great, a bandage should be carefully applied to the limb, from below upwards, and from above downwards, to give support to the diseased tissues, and prevent the burrowing of matter along the muscular sheaths, and by constant and uniform pressure, to squeeze out the pus as fast as formed. Injections of *Carbolic acid*, or *Calendula* lotions should be thrown into the cavity of the joint, two or three times a day, and kept constantly applied to the part, by means of charpie, or patent lint, in order to absorb the discharges as fast as thrown out. *Belladonna*, *China*, *Hepar Sulph.*, *Calc. carb.*, *Silicea* and *Sulphur* may be given internally as circumstances require. If the patient possesses a lymphatic or scrofulous constitution, the last-named remedies will prove exceedingly beneficial. When the quantity of pus is excessive, and the joint is pressed upon in all directions by the exuded matter, a free, direct incision should be made to admit of free drainage, and the dressings be kept constantly in contact with the diseased tissues. *China* in such cases will be found an exceedingly valuable remedy, and should be given internally two or three times a day.

In cases of uncontrollable and excessive suppuration, the parts

will either recover by union of their contiguous surfaces, or become so involved in the disease as to require removal. If the case proceeds favorably, as is most likely to occur, if the previous treatment be followed, the discharge will gradually diminish and the constitutional disturbance subside. In case of a termination of the injury by anchylosis, the limb must be placed in such a position as to be of the most service to the patient. If, during the treatment of the disease, either *erysipelas*, *pyemia* or *tetanus* set in, the remedies for the cure of these affections must be employed as recommended in the chapters devoted to the consideration of these subjects.

In the milder varieties of these wounds, where there is no risk either of life or limb, our chief object should be to guard against anchylosis, which is so prone to occur in all affections of the articulations. Passive motion, the judicious application of the roller, and the general and local measures recommended, will be the surest means to bring about a cure and frustrate bony union. *Primary* amputations may very properly be performed when a large joint is severely shattered, the external opening extensive, and the principal nerves and vessels of the limb injured. The rule, that all severe wounds of the large articulations of the extremities, especially when the result of gunshot or other injuries, are almost always fatal if amputation be not speedily employed, does not necessarily hold good. In a large number of injuries of the knee and ankle joints which fell under my observation during the rebellion, and which were treated as directed above, quite a number recovered, a few with anchylosis, and many others with partial motion of the joint. Of the number of cases which recovered with partial loss of motion of the limb only, I will mention four which involved the principal articulations. The treatment employed and the termination of each are also detailed.

COMPOUND FRACTURE OF ELBOW JOINT.

Case 1. Marcus Washburn, private, Co. A, 48 Ind. Vols., was admitted into the Mound City Hospital with a compound comminuted fracture of the left elbow joint, caused by a minnie ball which entered the outer aspect of the articulation, passed through

the joint and emerged at the inner and lower portion of the arm, as is shown in accompanying Fig. 227. The joint was extensively tumefied and very painful, synovia continually escaping from the joint, mixed with pus. The limb was bandaged and splints applied as directed heretofore, and the arm kept in an elevated position. The treatment consisted in the use of *Calendula* internally and externally, and weak injections of iodine thrown into the joint from time to time, as occasion demanded; with the use of *Aconite*, whenever fever was present; *Hepar sulph.* and *Silicea* were administered during the suppurative process. A healthy, generous diet was ordered during the continuance of the inflammatory action, and in thirteen weeks after infliction of the injury, the patient was so far recovered as to be discharged from the hospital. He left the institution with a tolerably good limb, and possessing more than one half motion of the joint; was able to move the arm in various positions and attend to his ordinary duties.

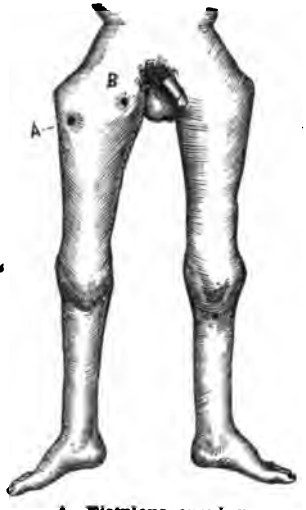
Fig. 227.

COMPOUND FRACTURE OF HIP JOINT.

Case 2. C. F. Larue, Company I, 28th Regiment Illinois Volunteers, was wounded at the battle of Fort Donelson, February 6th, 1862, by a musket ball entering the outer aspect of the thigh above the trochanter major, passing downwards and inwards, fracturing in its course the neck of the femur, and emerging at the inner and upper portion of the thigh below the os pubis and internal to the crural ring. Many spiculæ of bone were extracted and portions of the head of the femur passed away—extensive suppuration followed. The limb was surrounded with a roller from above the knee to upper part of thigh, placed in a horizontal position, and extension and counter extension made according to Swinburne's method. *Calendula* and *Arni-*

cated lotions* were used in weekly alternation (that is to say, the *Calendula* one week and *Arnica* the succeeding week, and so on), generous diet, good nursing, cleanliness and perfect rest, was had during treatment. *Hepar*, *Mercurius*, *China*, *Phosph.*, *Ruta grav.* and *Silicea*, comprised the remedies administered internally. The patient became very much emaciated (Fig. 228) at the time the drawing was made, had thrown off dressings, splints, etc., union having taken place between the fractured extremities of bone. He recuperated slowly and left the hospital thirteen weeks from receipt of the injury apparently cured. By means of a cane he was enabled to walk from the hospital to the railroad depot en route to his home on a furlough of thirty days. Since which, I learned that he had been discharged the service, with one and a half inches shortening of the limb, but motion slightly impaired.

Fig. 228.



A. Fistulous opening.
B. Exit of the ball.

COMPOUND FRACTURE OF KNEE JOINT.

CASE 3. Adam Shultzer, private, company H, 43rd regiment Illinois Volunteers, was wounded in the knee joint by a musket ball, during the battle of Pittsburg Landing. The ball crushed through the inner edge of patella, and passing inwards, penetrated the joint. When received into hospital the ball had not been extracted, although efforts were made for its removal. The wound was followed by intense inflammation and profuse suppuration, intermingled with synovial fluid, followed by swelling of the thigh, leg and foot. Abscesses formed around the joint from time to time, which were relieved by incision, and the fistulous tracks remaining, acted as so many vents for the dis-

*Arnica lotions were frequently used, even when other remedies seemed more appropriate, on account of its being more readily obtained.

Fig. 229.

A Entrance of bullet.

charge of matter contained within. A roller was applied to the limb from above, downwards, and from below, upwards, as represented in figure 229, and the limb placed in the horizontal position. *Calendula* and *Arnica* lotions were constantly applied to the part diseased, as mentioned in the preceding case, and internally were given *Belladonna*, *Hepar*, *Rhus*, *Mezereum* and *Silicea*, as demanded by the conditions of the patient. The general treatment consisted of a supporting regimen, absolute rest of the limb, and cleanliness; towards the decline of the inflammatory stage, stimulants were judiciously administered. The bandage was continued until all inflammation and swelling had entirely abated.

At this time* patient's general health had improved rapidly, suppuration had almost entirely ceased, a small quantity of synovial fluid escaping from the joint, and in one month afterwards recovery was firmly established, with partial motion of the joint.

COMPOUND FRACTURE OF THE ANKLE JOINT.

Fig. 230.

Case 4. William Kennedy, private, company A, 7th regiment Iowa Volunteers, was wounded at the battle of Belmont, November, 1861, by a musket ball passing through the left ankle joint, between the oscalcis and astragalus. Received into Mound City General Hospital November 13th, 1861, with considerable inflammation, and suppuration along the track of the ball. The patient, possessing a good constitution, I decided to save the limb if possible, as a triumph of conservative surgery. In a few days the inflammation increased, extensive suppuration and sloughing of the soft parts soon

*July 27th, 1862.

followed, with expoliation of bone. **Calendula* and *Arnica* lotions were continually applied to the joint, the roller carefully adapted, and the limb placed in a fracture box, to insure perfect rest of the articulation. The general health continuing pretty good, and no great emaciation ensuing, the only remedies used internally were *Hepar* and *Silicea*, with generous diet, etc., and on the 25th of March, 1862, the patient had completely recovered his health, and left the hospital with more than one-third motion of the joint. (Fig. 230.)

This case is especially valuable in one particular, viz: that amputation was decided upon by a council of surgeons as the only means by which life could be saved. I thought otherwise, and concluded to depend upon homœopathic agents and the conservative efforts of nature for a cure, which certainly proved the correctness of my prognosis.

CHAPTER III.

SYNOVITIS.

Synovitis—inflammation of the lining membrane of a joint—is liable to occur in any of the articulations, but especially in those of large size and of great functional activity.

When the secretion of the membrane becomes excessive, in consequence of inflammatory action, and mixed with a quantity of true serum, it constitutes *Dropsy of the Joint* (Hydrarthrosis).

---

*Other homœopathic remedies, which were more clearly indicated in the foregoing cases, might have been employed, and probably with better results, if they could have been procured. The few agents in our hands were purchased at *private* expense, the large number of wounded precluding, on this account, their general use. I have no doubt that if proper homœopathic remedies were added to the armamentaria of medical supplies furnished this Department, great benefit would be derived to the Government, both as to the saving of life and limb and the length of time ordinarily required for patients to remain in hospital.

It is not always confined to the synovial membrane, but frequently implicates the neighboring textures, while it may also manifest itself in several joints at the same time.

Etiology.—The various causes inducing synovitis are local and constitutional, as exposure to wet and cold, the presence of foreign bodies in the articulation, and mechanical violence. Generally, however, it may be traced to the effects of rheumatism, scrofula, syphilis, gout, eruptive fevers, or the inordinate use of mercury. When resulting from local injury, as blows, wounds or sprains, the surrounding structures entering into the composition of the joint often become the seat of inflammatory action, not unfrequently leading to very serious results.

Symptoms.—The symptoms consist of stiffness of the joints, pain greatly increased by motion, tenderness upon pressure, swelling and fluctuation, a pale, shining appearance of the skin, with sense of heat in the affected part. As the inflammation increases, severe constitutional symptoms are developed, the fever becomes high, with redness of the face, coated tongue, intense thirst, loss of appetite and sleep, together with more or less derangement of the digestive organs. The limb affected assumes a position permitting the greatest distension of the cavity of the joints; thus, in synovitis of the knee, the leg will be partially flexed upon the thigh, the whole limb slightly adducted; if the hip be affected, the thigh is flexed on the pelvis, adducted and slightly rotated outward.

Occasionally, however, the disease is very gradual and insidious in its attack, the swelling being scarcely noticeable, the pain and tenderness, together with the aggravations by motion, producing no serious inconvenience for weeks and perhaps months.

Rheumatic Synovitis, generally occasioned by exposure to wet and cold, or excess in eating and drinking, is indicated by soreness in the joints, excessive pain and tenderness from motion and percussion, discoloration of the surface, with rigors and high febrile excitement.

The inflammation is often manifested in several of the joints simultaneously, the knee, ankle, elbow, wrist and fingers being the most frequently affected.

Syphilitic Synovitis can be readily distinguished from other

varieties by the history of the case; by the presence of syphilitic symptoms in other parts of the system, aided by the circumstance that the pain is *particularly severe at night*, especially after the patient becomes warm in bed.

Fig. 231.

A Caries and necroses.
B Perforation in head of tibia.
C Disorganization of cartilage.

Scrofulous Synovitis, peculiar to subejcts of a strumous diathesis, is commonly met with in children, from three to seven years of age. Its favorite seat is the hip, knee and elbow. Disorganizations of the joints in strumous subjects are extremely apt to take place, involving the cartilages and articular ends of bones, becoming carious, inflamed or necrosed and sometimes infiltrated with tubercle, as is shown in the annexed Fig. 231.

Terminations.—Uncomplicated acute synovitis will usually terminate favorably, especially if dependent upon rheumatic influences. In other cases, there is a marked tendency to adhesion of the opposed surfaces, in consequence of the flow of plastic matter. Not infrequently the plastic deposit "assumes the form of warty vegetation, or concretions within the joint, or of bands stretched across its interior, or incorporated with its capsule, occasioning more or less permanent stiffness."

Suppuration, or the formation of purulent secretion in the cavity of the joint (*arthropyosis*) is seldom a result of ordinary synovitis, being usually observed, if at all, as a consequence of wounds of the joints, or in the case of scrofulous patients, in which it is the chief danger to be apprehended. The disintegration of textures composing the articulation, is often so great as to produce entire disorganization of the interior of the joint; more or less complete loss of function necessarily resulting.

Subsequent weakness of the joints, with predisposition to disease, result from even very slight attacks of inflammation, and continues for a long time after an attack, the most trivial causes often proving sufficient to induce a return of the original symptoms.

Treatment.—The treatment of this affection depends not only upon the severity of the symptoms, but also on the causes producing it; therefore it is impossible to do more than present to the reader those general underlying principles that will guide the surgeon in all cases that may fall under his hands. If the inflammation is acute and the disease is dependent upon an injury done the articulation, *Aconite* given internally, and either *Arnica*, *Hypericum* or *Ruta* applied locally in the form of fomentations to the part, and frequently renewed, will be of essential service if the patient is seen immediately after the accident. If the inflammation runs on unchanged in spite of these means, and the parts become swollen, red and œdematous, fomentations of *Belladonna* continuously applied to the joint will oftentimes be productive of great benefit, especially if the patient be young and vigorous.

If the disease partake of a rheumatic character, fomentations of *Aconite*, *Rhus tox.*, *Ruta grav.* or *Cimicifuga*, one part of the remedy with three of water, will be found very serviceable in ordinary cases. In all cases, the limb should be placed in an elevated position and either of the following remedies given according to the indications, viz: *Aconite*, *Colchicum*, *Conium*, *Belladonna*, *Bryonia*, *Ledum*, *Mezereum*, *Iodine*, *Kali jod.*, *Mercurius*, *Nux vomica*, *Pulsatilla*, *Rhus tox.*, *Ruta grav.*, *Tartar emetic*, *Veratrum* and *Sulphur*. Among the newer remedies are recommended, *Apocynum*, *Acid Sulphuric*, *Asclepias tuber.*, *Propylamin*,*

* This remedy is prepared by distillation, from herring brine, and in 250 cases of acute rheumatism treated by Dr. Amenarius, of St. Petersburg, the pain and fever disappeared in every case the day after its administration. My experience in the use of this remedy is limited, but in all cases of acute rheumatic fever in which I gave it alone as soon as called in, the patients were promptly relieved in thirty-six hours and convalesced in a few days without any untoward symptoms. The *propylamin* is found in two forms, the *liquid*, a distillation from the herring brine, is colorless, transparent, and possesses the fish-brine odor; the *muriate* is in the form of white crystals very soluble in water, one grain of which is about equal to one drop of the liquid. *Dose*—two or three drops in a wine glass full of water and taken every two hours, for an adult.

Viola odor. and *Viscum album.* but their value in the curative treatment of this disease, except the *Sulphuric acid* and *Propylamin*, I am unable to state. In certain seasons, in my hands, the greatest benefit has arisen from the use of mineral acids and especially *Sulphuric.* The number of cases under treatment have not been sufficiently large to arrive at positive conclusions, as I did not feel justified in neglecting local treatment, but in all the cases that fell under my observation last spring (1871) every one was completely cured by this internal agent alone, after the acute symptoms had been subdued by *Aconite*, and I believe a careful trial of this remedy will satisfy any one of its great curative value in rheumatic fever. One of the following remedies may be selected according to the indications and the nature of the pains.

Aconite.—In rheumatic fever characterized by high fever, dry heat, thirst and redness of the cheeks, attended with pinching, shooting or tearing pains, heat and shining swelling of the parts, stitching, throbbing pains, and a sensation as if a tight bandage was drawn around the joint, particularly when there is more or less violent excitement of the circulation, the joint being red and hot.

Actea racemosa (Cimicifuga) has proved itself exceedingly useful in those cases, when in connection with inflammation of the joint there has been wandering rheumatic pains in various parts of the body, pain in the eyeballs, chilliness alternating with heat, great distress of mind, and especially in a metastasis to the heart and its envelopes, swelling and heat of the affected parts, pains increased by motion.

Bryonia when the pains are tearing and stitching, with stiffness and swelling in the joints, countenances allow, or flushed and hot, tongue coated with a whitish fur, skin hot and dry, acid perspiration, frequent and soft pulse, bitter taste or dryness in the mouth, and especially when all symptoms are excited and aggravated by movement, when the fever is less of an inflammatory type than that which calls for the use of the following remedy.

Belladonna, for rheumatism in the right elbow or shoulder joints with violent and distressing, cutting or tearing pains striking from the shoulder to the elbow joint on raising the arm, also when the least motion causes most violent pain, or wandering

pains accompanied with redness and swelling in the joint, aggravated by motion and exascerbating at night, attended with hot, dry skin, thirst and high fever, pains in the joints like electric shocks along the limbs, with red, shining swelling of the joints.

Mercurius, in inflammations of the smaller joints accompanied by swelling and redness. The pains are hard aching and are felt in the long bones, and especially those which are only covered by cellular tissue and integuments, are worse at night and becoming almost intolerable. The rheumatic affections to which mercury is homœpathic are generally attended with a feeling of coldness or chilliness in scrofulous subjects, and when suppuration threatens it is especially useful.

Phytolacca decandra.—Dull, heavy pain in the joint increasing when exposed to the air, especially in damp weather, sensation like shortening of the tendons behind the knee when walking, pains extending either upwards or downwards along the shafts of the femur or tibia, neuralgic-like pains in the joints increased by motion or pressure, worse on the right than the left side, syphilitic and mercurial affections of the joints with nightly exascerbations.

Colchicum is eminently curative in inflammation of the smaller joints accompanied with tearing, jerking, lacerating pains, worse at night, and increased by motion, care or anxiety, or in stiffness and lameness of the joints in attempting to walk, with swelling of the parts in the vicinity of the disease; it is particularly indicated when the skin is moist and the urine turbid. Marcy & Hunt say that they "have found a single drop of the first dilution, given every three or six hours according to the nature of the case, very efficacious in several obstinate cases which had resisted the action of other remedies, especially when occasioned by wet and cold weather.

Ruta graveolens is especially adapted to inflammation of the larger joints, especially of the upper extremities, accompanied with all the usual symptoms of high vascularity of those articulations. I have frequently used it with the greatest success when all other remedies failed to have a beneficial influence.

Pulsatilla has a special action on the synovial membranes of the knee, ankle and tarsal joints, but is more frequently indicated in rheumatic gout than in genuine rheumatism.

Rhus tox.—Drawing, tearing pains in the coverings of the joints, attended with a sense of lameness and formication in the affected parts, with or without swelling, and worse in damp weather; pains increased during rest and when first beginning to move them, but getting better from continued motion; great restlessness. It is better adapted to the milder forms of the disease, or when the inflammation has been subdued by the preceding remedies, and when the tendons, fascial sheaths of the nerves, etc., are affected, rather than the synovial membranes.

Nux vomica.—If the swelling of the joints is pale and the disease has affected the muscles of the chest and back, it often acts like a charm. Dr. Jahr, in his forty years practice, relates a case showing the wonderful effects of the remedy. He states: "In a desperate case of this kind, where the feet, legs, hands and arms, and likewise the chest and back, were invaded, the patient was lying in her bed with the most excruciating pains. Being anxious to avoid every kind of homœopathic aggravation, I poured a teaspoonful of a solution of two globules of *Nux* 30 into another tumbler and a teaspoonful of this solution into a third tumbler of water, and ordered a teaspoonful of this third solution to be given the patient every three hours until I should see her again next morning. The prescription was made at 10 o'clock at night. When I saw the patient again the change was extraordinary. Soon after taking the first dose she had dropped to sleep; slept quietly the whole night for the first time in eighteen days. The rheumatic swelling, as well as the pains, had decreased and disappeared entirely in three days, simply by continuing the solution out of the third tumbler."

Tartar emetic is more decidedly en rapport with inflammations of the joints in the lower extremities. I have found much benefit from its use in synovitis accompanied with furred tongue, coldness of the extremities, and especially when complicated with cutaneous eruptions that have been repelled.

Rhododendron, when the pains are worse at night and during rest, leaving a sensation of stiffness and lameness in the joints, attended with periodical drawing pains in the lower extremities, aggravated by stormy weather and rest, and not permitting the patient to sleep at night.

Apocynum cannabinum, is most useful in synovitis after the acute stage has passed and effusion has taken place in the joint. It causes absorption of the liquid thrown out into the articulation, and in this way produces beneficial results.

*Viola odorata**.—Three cases are given of the curative effects of this drug in rheumatic synovitis, all of which were severe and occurring on the right side of the body; improvement began within two days; complete recovery followed rapidly. The 12th potency was used.

Viscum album†.—Dr. W. Huber, in his "Observations on the White Mistletoe," reports four severe cases of rheumatic synovitis of the knee and ankle joints cured by this remedy. The potency of the medicine used was the *third*, given every two or three hours, according to circumstances.

Dulcamara.—This remedy is highly praised by Dr. Petroz ‡ in articular rheumatism brought on by exposure to a cold, damp temperature. The disease affected the articulations of the wrist; was followed by sharp pain caused by the least movement; sensation of cold whilst resting, fever, etc. *Dulc.* 24th cured the patient in seven days, since which the health has been continually good; is particularly valuable in those cases traceable to continued exposure to a damp atmosphere.

When the synovitis is of a sub-acute or chronic character, the same principles of treatment will be adopted, modified according to the intensity of the affection. If the disease be of a syphilitic origin, or complicated with mercurial poison, the remedies adapted to those conditions will require to be used either alone or in alternation with the specifically indicated medicine.

The *local treatment* consists in placing the joint at rest, in an easy, elevated position upon a pillow or bolster, having a piece of oilcloth spread upon the bedding to protect it from the dressings. In some instances it may be necessary to put the limb in splints, or other suitable apparatus, to insure quietude and prevent the affected surfaces aggravating and protracting the

* British Journal of Homœopathy, vol. 24, p. 315.

† British Journal of Homœopathy, vol. 22, p. 643.

‡ Petroz on Therapeutics, British Journal of Homœopathy, vol. 23, p. 643.

morbid action by rubbing against each other. From neglect of this precautionary means, so vitally important to the patient's complete recovery, I have no doubt many joints have been destroyed that otherwise might have been preserved and restored to usefulness.

In the event of failure of the above remedies, or if the case has been neglected in the onset and the disease seems to progress, or be inclined to become rebellious to all treatment, I have, in a few instances, painted the joint with a preparation of collodiated cantharides for the purpose of producing vesication over the surface of the articulation, then dressing the parts with an ointment of *Ruta grav.*, thinly spread upon a piece of linen and covered with a strip of oiled silk, to preserve both heat and moisture in the part. In persistent inflammations of the joint of a more subacute or chronic character, great relief has been experienced by frequently painting the articulation with tincture of *Iodine*,—this is especially serviceable in hydrarthrosis or effusion of serum into the joint. Grated horse-radish poultices applied locally for two or three days have, under certain circumstances, been productive of much benefit.

The *hypodermic* injection of *Atropine** has been highly recommended by Dr. McSwinney in the two following cases:

Case 1. "Rev. —— ——, a strong, healthy man, was visited by me on October 4th, 1859; slept in a damp bed a few days before; was seized with shivering and had an attack of acute rheumatism; has pain in all his limbs, which are swollen and red, both the upper and lower extremities; had no sleep for several days before. I injected the thigh with the 24th part of a grain of *Atropine*, which, after producing its characteristic effects in the system at large, subsequently removed all pain, so much so that in a few days afterwards he was convalescent and required no further treatment."

Case 2. "W. C., aged 60, a healthy man of temperate habits, much exposed to wet and cold, became a patient of mine in November last, suffering from acute rheumatism; disease affecting the wrists, elbows and extremities; came on sharply, attended

* British Journal of Homœopathy, vol. 24, p. 505.

with general feverishness and profuse perspiration. *Four Atropine* injections, in the space of fourteen days, completely restored this man to perfect health and strength."

If the disease continues, and matter is formed within the joint, it must be evacuated, as in abscesses in other parts of the body. The incision into the joint should be small and subcutaneous, and after the contents are drawn off, the opening should be immediately closed by a piece of adhesive plaster, to prevent the admission of air into the joint. As soon as pus is ascertained to be in the joint, it must be removed immediately, as delay will be productive of the most serious consequences, the confined pus keeping up pain, impairing, and ultimately destroying the vitality of the parts with which it comes in contact.

The surgeon need not despair in effecting a good cure, says Gross, even after suppuration has taken place; the probability will certainly be that the joint will be stiff, but it should be recollected that an anchylosed joint is always better than no joint at all, provided of course that it be put in a proper position for future usefulness.

When the disease has passed into the *chronic state*, bandaging, friction, stimulating lotions and the douche, will be of great service as local expedients in assisting to bring about recovery, in addition to the remedies above mentioned. The joint should be washed every morning with warm water and castile soap, then douched, and afterwards thoroughly rubbed with some stimulating lotion, or painted with equal parts of tincture of iodine and alcohol, and finally put up in a roller, beginning from the distal portion of the limb upwards, so as to afford gentle and equable pressure on every part. As the disease declines, the joint should be moved gradually and cautiously at first, and increasing the motion from day to day until free motion is produced. Exercise should be taken in the open air, a good generous diet permitted, and the appropriate remedy continued in the higher potencies once or twice a day, as circumstances demand.

CHAPTER IV.

ARTHRITIS.

Etiology.—By **Arthritis** is meant an inflammatory disease of an acute or chronic kind, of the whole or greater part of the structures that enter into the formation of a joint. This affection may commence in the synovial membranes, and then spread to the other articular tissues, or it may begin in the cartilages or bones, and in some rare instances it may perhaps take its origin in the fibrous capsule surrounding the articulation; whether it can ever commence in the ligaments, is a question that is not as yet satisfactorily determined.

Acute Arthritis may present any of the evidences of inflammatory action, from the simplest degree of vascular congestion of the articular covering and membranes, to the terminations by suppuration and necrosis, or death of the bony structure involved. When fibrin is poured out into the surrounding areolar tissues, or between adjacent synovial surfaces, as the result of an acute arthritis, changes of function in the joint, with more or less destruction of tissue, supervenes, impairing to a greater or less extent the use of the limb, and presenting to the surgeon a disorder of the most serious character. This condition corresponds to *chronic arthritis* of most authors, and is named in accordance with the articulation involved. When developed in the knee, especially in tuberculous patients, it is known by the term "*white swelling*;" when in the hip joint, it is especially designated as *morbas coxarius*, or *coxulgia*, to which the attention of the reader is referred. Chronic arthritis, in a tuberculous diathesis, like pneumonia, may be the exciting cause of tubercular deposit in the bones, and thus develop tubercles in the articular extremities of bones. In almost every instance it is the result either of an acute or sub-acute inflammation, that has been unchecked by appropriate treatment or kept up by repeated injuries.

Symptoms.—The symptoms of acute arthritis vary in accordance with the intensity of the inflammation and the character of the joint affected, but a greater or less degree of *pain*, with

restricted motion and tumefaction, is attendant upon it under all circumstances.

Usually the pain is intense, the slightest motion, or even attempt at movement, is absolutely intolerable. *Swelling* of the articulation, more or less marked, is due to the effusion of serum into the synovial capsule, where it is restricted by its reflections, producing *synovitis*, a condition of disease already described. The pain is often severe, tensive and throbbing; so acute is it sometimes that the patient screams with agony; he cannot bear the bed to be touched, the room to be shaken, or the slightest movement communicated to the limb, any attempt at examination of the joint in such cases being attended with insupportable agony. There are usually nocturnal exacerbations, and the pain is commonly referred with especial severity to one particular spot in the joint; thus it is generally felt at the inner or underside of the knee joint, and at the outer aspect of the hip. The heat of the diseased joint is considerable, and is often accompanied with more or less superficial redness. The swelling is uniform, involving the whole of the articulation, and not projecting at certain parts of it, as when the synovial membrane alone is affected; it is generally not very considerable, and has a soft and doughy rather than a fluctuating feel. As the disease advances, however, the swelling generally increases suddenly, and to a considerable extent, either in consequence of the irritation of the synovial membrane or of the accumulation of pus within or around the joint. In many cases the synovial membrane gives way, and the pus from the interior of the joint becomes widely diffused through the muscular interspaces of the limb, forming enormous abscesses and long sinuous tracts. The position of the affected limb is peculiar, and that attitude is insensibly adopted in which the patient will have the greatest amount of ease; thus the knee is semi-flexed and turned outwards, and the thigh is adducted, and the elbow is bent. Spasms or startings of the limb, often of a very sharp and painful character, come on at times, more particularly at night.

The constitutional disturbance is very severe, and of an actively febrile type. As the disease progresses, suppuration takes place within the joint, which becomes hot and red, with a good deal of

throbbing pain, and at last fluctuation is perceived where the coverings are thinned. In some cases the suppuration occurs with very great rapidity, and luxation of the head of the bone takes place. In other cases an abscess forms external to the articulation, and extensive purulent collections become diffused through the limb. As the joint becomes loosened by the destruction of its ligaments, the bones become mobile, and grate against one-another where the incrusting cartilage has been removed, thus giving rise to very severe suffering. The cartilages may, however, in some cases, be very extensively destroyed, and yet no grating take place; this is owing either to the destructive action being limited to the edge of the incrusting cartilage, the opposing surface being sound, or else to the interior of the articulation being filled up with plastic matter after the removal of the cartilages. But, though abscess, either within the joint, or external to it, usually forms when the bones grate and the cartilage disintegrates, yet, it occasionally happens that these conditions may take place—those symptoms that are indicative of the erasion of the cartilage, such as painful startings of the limb, grating, and preternatural mobility of the joint—and yet no abscess forms; all the symptoms subsiding under proper treatment, and the joint recovering, though, perhaps, with certain degree of anchylosis. If suppuration take place, the constitutional disturbance usually partakes of the irritative type, the patient suffering severe pain, and being worn out by want of rest. Hectic may occur and death from exhaustion and irritation, unless the diseased part be removed; in other cases it falls into a state of chronic thickening, with perhaps fistulous openings leading down to the diseased structures, and in some of the more favorable instances the patient may recover, with a prematurely rigid bone.

Abscesses may form external to, but close upon, the capsule of a joint, and closely simulate disease of the articulation. In these cases the absence of serious constitutional disturbance, the irregularity of the swelling greater on one side than the other, the absence of all rigidity about the joint, and of other severe local symptoms, such as pain, starting, looseness, or grating, will enable the surgeon to effect a correct diagnosis.

Treatment.—In the treatment of acute arthritis, the first thing

to be observed is perfect rest of the diseased articulation; for, without this, the most systematic course of treatment will effect little or no good. The limb should be carefully supported on a pillow, or laid upon a well adjusted and softly padded splint. If the position is not one that will induce the utmost relaxation of the ligaments forming the articulation, it will prove injurious and keep up the congestion; but when position induces this relaxation, and is combined with rest, it constitutes a most valuable portion of the local treatment, especially when the disease invades the hip, knee and elbow joints. In the acute stage of this disease *Aconite* given internally in appreciable doses, and frequently repeated, and combined with assiduous fomentations of the same to the part affected, has accomplished most satisfactory results. In a few cases, especially when the disease has invaded the smaller articulations,* fomentations of *Hypericum* have been of essential service. *Cimicifuga* has been used with much benefit in those persons who possessed a rheumatic diathesis. After the violence of the attack has passed away and the disease has assumed a chronic or sub-acute form, other remedies may be advantageously substituted. If the affection has been brought on by mechanical injuries or severe and protracted exercise, *Arnica* is the remedy. If the symptoms indicate a rapid change of locality, with a disposition to change its position in the affected limb, and relieved by contact with the cool air, *Sabina* or *Pulsatilla* are indicated. *Digitalis* is valuable when the symptoms are gradually changing in character, the disease having continued for a length of time without material abatement. *Staphysagria*, *Arsenicum*, *Acid Benzoic*, *Kali bich.*, *Phytolacca dec.*, *Sulphur*, *Veratrum vir.*, are often highly beneficial during treatment, and especially in those protracted cases involving various systemic derangements. In connection with its development in a rheumatic or gouty diathesis, arthritis comes especially under the notice of the physician, and the constitutional and local treatment of rheumatism or gout is alike applicable to its cure.

Sub-cutaneous injections of *Morphine*, *Atropine* or *Aconitine* immediately over the diseased articulation, has brought

*See vol. 1, p. 247—Fomentations, and how employed.

entire relief from pain and secured a good night's rest when all other remedies have failed. *Chloral hydrate*, in the hands of the author, has proved of great value in relieving the violent paroxysms of pain.

CHAPTER V.

DROPSY OF THE JOINTS.

Dropsy of the Joints (*Hydrops Articuli*, *Hydrarthrosis*), is a term used to express a superabundance of fluid in an articulation, resulting from chronic inflammation of the synovial membrane. The knee is the favorite seat of this affection, the elbow and ankle being the joints implicated next in frequency, whereas the orbicular joints are rarely attacked.

Etiology.—The causes conducing to this condition are local and constitutional; the former includes every variety of injury having a tendency to produce inflammatory action in the joints, as sprains, blows, wounds, contusions, luxations, and the presence of intra-articular bodies. The constitutional causes are not always apparent. In general, however, it may be remarked that this affection is found associated with a rheumatic diathesis. In persons of strumous habits, it is frequently observed to supervene as a sequel of eruptive fevers. It may also be occasioned by gout, syphilis, suddenly checking the perspiration, or by an inordinate use of mercury. It frequently, however, exhibits itself without any assignable cause.

Symptoms.—The swelling of the joint, which is irregularly circumscribed and fluctuating, together with the circumstance of its being unaccompanied by severe pain, is the most characteristic symptom. The skin is rarely changed in color, while the progress of the disease is generally very slow, several months elapsing before the tumor becomes of any considerable size. Provided the true nature of the difficulty cannot be readily deter-

mined by the history of the case, the fluctuating and indolent character of the tumor, together with comparatively little pain upon motion or pressure, recourse to the exploring needle will immediately remove all doubt.

Pathology.—Concerning the pathological condition exhibited in this affection, Dr. Gross writes: "Enough is known to show that there is generally, especially in cases of long standing, considerable opacity and thickening of the synovial membrane, with some degree of vascularity, the vessels being spread over the surface of the membrane in delicate, arborescent lines, widely separated from each other. Occasionally slight deposits or patches of lymph exist, giving the part a rough, uneven appearance, but this is infrequent. The cartilages and bones present no perceptible changes, nor do the muscles and other parts around the joints, except that they are more or less displaced by the dropsical distension. When the accumulation is very great, the capsular ligaments, pressed upon in every direction, become very much stretched and attenuated. Cases occasionally occur where the ligaments are so much distended as to give way, thus allowing the fluid to diffuse itself among the surrounding structures.

The dropsical fluid is generally of a pale, yellowish, straw or amber color, and of a ropy, unctious, or sero-oleaginous consistence; sometimes it is turbid, whey-like, or sanguinolent, and intermixed with flakes, shreds, or masses of lymph. Its quantity is variable, depending upon the size of the joint, the duration of the case, and other circumstances. In the knee it frequently amounts to from six to twenty ounces."*

Treatment.—The treatment of this affection will depend upon the nature of the existing cause and its removal. It must ever be remembered that dropsy of the joints like dropsy in other parts of the body, is merely a symptom of disease, and hence the attention of the surgeon should first be directed to the condition of the system producing it, and until this is discovered and removed, little benefit will follow even our best directed efforts to control the effusion.

---

* Op. cit., vol. 1, p. 994 *et seq.*

When the dropsy has been the result of a sprain, contusion or other injury, *Arnica*, *Hypericum*, *Ruta*, *Calendula*, or *Rhus*, externally and internally; elevation, rest of the limb, a judicious application of the roller if the affection is chronic, with an easy and relaxed position of the parts, will ordinarily effect a cure. In the milder varieties of dropsy, friction with aconite lotion, mercurial unguents, soap liniment, and iodine ointment, rarely fail in promoting absorption of the effused liquid and relieving the size and tension of the swelling. The remedy selected should be applied two or three times a day, being rubbed upon the whole of the affected part with the bare hand, until a decided glow is felt by the patient, when it should be discontinued, to be again repeated whenever demanded, in the same careful and efficient manner. In the meantime the parts should be well supported with the roller, extending from the distal extremity of the limb upwards. The pressure assisting powerfully in aiding the reduction of the effused fluid.

When it is evident that the absorbents have been fairly aroused, which is known by the gradual and continued decrease of the fluid within the sac, the cold douche may with benefit *precede* the inunction method, or what has been highly recommended, the alternate application of hot and cold water, applied in quick succession.

When all ordinary means have failed, the plan recommended by Velpeau, Iobert, and Bonnel, of injecting into the joint tincture of iodine diluted with two or three parts of water, has produced the most satisfactory results. The injection in no case inducing any serious consequences; but in several instances a complete cure was had without anchylosis, "a *new and healthy action* having been imprinted on the synovial membrane." Before throwing the injection into the cavity of the joint, *evacuation* of the contained fluid should be attempted by subcutaneous puncture, made at the most dependent and superficial portion of the swelling and carried along the cellular tissue until it reaches the sac, which is then pierced in the ordinary manner. The iodine or other injection to the amount of two or three ounces should be placed in a syringe which is introduced into the incision thus made, and the liquid thrown into the sac and retained for one or two minutes, the joint

being pressed slightly in order to bring the solution fully in contact with its diseased walls. It should then be permitted to flow out spontaneously, the opening closed, and the case treated as circumstances demand.

The remedies recommended in the treatment of this disease are: *Apoc. can.*, *Ant. crud.*, *Apis*, *Arsenicum*, *Bryonia*, *Calcarea carb.*, *Digitalis pur.*, *Ledum*, *Kali bich.*, *Kali carb.* *Rhus*, *Iodine*, *Lycop.*, *Mercur.*, *Sabina*, and *Sulphur.*

Antimonium crudum is valuable when in conjunction with chronic arthritis or hydrops articuli, there is more or less gastric disturbance, or when in consequence of a rheumatic or gouty diathesis, concretions have formed within the cavity of the joints; it is also recommended when there is great sensibility to cold, contraction of the tendons with sense of weight in the extremity.

Apocynum cannabinum is productive of good results when dropsy of the joint is dependent upon a rheumatic diathesis in which more or less derangement of the kidneys occurs.

Apis mellifica is also of value in chronic inflammations of the joints, terminating in effusion, where there exists urinary difficulties, such as retention of urine with irritation of the bladder, strangury, with heat and dryness of the mouth or suppression of urine.

Arsenicum, when the pains are of a burning character, and worse at night, with great weakness and emaciation of the diseased limb, appetite poor, countenance pale, with dread of exercise.

Bryonia, when the pain is of a stinging, tearing, shooting character, and the effusion depending upon or induced by rheumatic exposure; when aggravation of all the symptoms follow motion of the limb, and especially when erysipelas attacks the diseased joint.

Calcarea carbonica, when the patient is pale, debilitated or of a scrofulous constitution, with drawing pressure in the joints, and especially when the disease assumes a chronic character and the effusion is slow in developing itself.

Ledum palustre is particularly adapted to effusion within the knee joint, as also within the smaller articulations, with aching,

tearing pains, coldness or inclination to chilliness, it possesses a powerful action on the absorbents and is useful both in the acute and chronic stages of the affection.

Jodium, in scrofulous inflammation of the joints, followed by effusion, when the articulation is swollen, red, with aching, throbbing pain; in acute attacks which are the result of some suddenly acting cause of a rheumatic or arthritic character; in inflammations of a torpid nature, with moderate fever, fistulous openings, discharging a thin, ichorous discharge, emaciation, after abuse of *Mercury*.

Rhus toxicodendron is most useful in sub-acute affections of the joints, characterized by stiffness, lameness of the articulations and stinging pains in the tendons and coverings of the joints; the pains are generally increased during repose and become even *worse on first moving* the part, but *abates* during continued movement; soreness of the joints as if beaten, languor and weight in the extremities, especially the lower.

Mercurius is indicated when the disease is accompanied with syphilitic complication; in rheumatism, especially affecting the knee and shoulder joints and terminating in dropsy of the articulation, and associated with tearing or heavy, dull pains, the symptoms are exascerbated at night with profuse sweat.

Lycopodium, for persons who take cold easily; the affected joint most painful during repose, and when relieved by external warmth and aggravated in cold rainy weather, the joints are stiff and heavy, with a parched condition of the skin, ill-humor, sad and dejected in spirits.

Kali hydriod. has been used somewhat extensively in hydrops articuli, and is extremely valuable when the disease is dependent upon a mercurial taint, and particularly so when the cartilaginous coverings of the bones composing the joint are implicated in the morbid process; pains in the joint worse during rest and going off during motion. *Kali bich.* in the high potencies has proved a valuable remedy in dropies of the knee joint partaking of a catarrhal nature.

Aurum, *Nitric. acid.*, *Silicea*, *Calcarea*, *Phosph. acid.* and *Sulphur* are highly beneficial remedies in inflammations of the synovial membrane brought on by excessive doses of *Mercu-*

ry, and *Bryonia*, *Lycopod.*, *Rhus* and *Sulphur* when the affection is the result of a rheumatic or gouty diathesis.

Calcarea carb. and *Sulphur* have been of most service in those cases of hydrops articuli occurring in lymphatic or scrofulous constitutions.

At the commencement of the affection *Belladonna* and *Merc. jod.* have been used in alternation by the author with the most satisfactory results, and followed with *Kali hyd.* and *Ledum pal.*, in the secondary stage, with an occasional interpolated dose of *Sulphur*, have proved exceedingly efficacious. With these remedies I have succeeded in curing two or three very severe cases of this disease, after having been previously subjected to the various remedies of the heroic school, with no apparent advantage. The potencies used were from the third to the twelfth. A case under treatment at the present time, in the Good Samaritan Hospital, is rapidly being cured by the treatment recommended above, that is, *Mercury* and *Belladonna* in alternation, followed by the other remedies as directed, and is the most successful treatment, thus far, that I have ever witnessed in these disorders.

CHAPTER VI.

WHITE SWELLING.

"White Swelling" is a peculiar form of arthritis usually developed in the knee joint, and occurring especially in subjects of a strumous habit. The structures exterior to the articulation are the parts primarily affected, the areolar tissue becoming thickened and infiltrated with a substance of jelly-like consistence, while, also, at a later stage a pale yellow, translucent deposit occurs between the capsular ligament and that portion of the synovial membrane lying in contact with it. Subsequent effusions frequently glue the muscles, tendons and ligaments together, thus producing *false anchylosis*. The inflammatory

action continuing, the cartilages and articular extremities of the bones become involved; matter collects in the joint; caries or necrosis ensues; the tibia becomes more or less displaced, the condyles of the femur projecting forward, the joint becoming permanently anchylosed. Provided, also, the discharge be profuse and the constitutional irritation severe, the patient will be likely to sink by hectic; or, if amputation be resorted to, may subsequently manifest signs of phthisis.

Symptoms.—At the commencement of the disease the symptoms are not generally urgent, a slight degree of tenderness and pain frequently existing for a considerable time, unattended by other evidences of diseased action. Gradually the pain and tenderness increase; the parts become tumefied with more or less stiffness of the joints and a sensation of heat. The skin presents a *whitish*, *shining* and *tense* appearance, while in acute arthritis, rheumatism and gout, the surface has a peculiar *bluish* or *pinkish* hue, with more or less enlargement of the superficial vessels. In manipulating the joint, "no sense of fluctuation is communicated to the touch, but a peculiar sensation is perceived which indicates the presence of a thick gelatinous substance beneath the skin, this substance presenting a soft, pultaceous mass, which yields somewhat to pressure, but does not permit the skin to pit, as in œdema, unless accompanied with inflammation of the integuments." This condition may remain for months, and even years, without exhibiting any marked change. Eventually, however, the heat and tumefaction increase; the skin becomes much distended, evincing vascular congestion, and assumes a purple hue. Ulcerations rapidly succeed, with the discharge of unhealthy pus, followed by hectic, colliquative sweats and diarrhœa, or perhaps by equally fatal symptoms of thoracic disease.

Prognosis.—The prognosis of white swelling should be guarded, the result depending upon the severity of the attack, the constitution of the patient and the treatment employed. For impaired constitutions it may justly be considered a serious disease, and may terminate in death by hectic, in anchylosis, or by recovery after the loss of the limb by amputation. Cases are recorded where tuberculosis of the lungs has set in and carried off the

patient, after amputation of the limb, even when the patient had apparently recovered.

Treatment.—In the treatment of this affection, it must not be forgotten that we have to manage a scrofulous or impaired constitution and its effects. Our chief object, therefore, should be to prevent, if possible, the occurrence of suppuration. In the early stage, when the disease has advanced insidiously with no acute symptoms, the remedies recommended under the head of Scrofula, vol. 1, page 372, will be found exceedingly efficacious, and in a majority of instances such means will be competent to effect a cure, without the necessity of local expedients. It is important throughout the treatment to maintain the limb in perfect rest, which may be effected by pasteboard or leather splints adapted to the contour of the limb. Generous diet and the employment of the best directed hygienic measures will be found absolutely indispensable. In the advanced stages of the disease, I have found the most excellent results follow the use of *Silicea* internally and starch bandages applied locally but not to interfere with the circulation of the diseased limb. The practice of leeching in this disease, as well as in all diseases of a strumous origin, cannot be too strongly reprobated. Caustic issues, blisters, the moxa and all such severe means used by the allopathic school, are pernicious and productive of more injury than benefit in this affection; stimulating embrocations, frictions, the frequent application of salt-water douches, electro-magnetism, are oftentimes beneficial, when inflammation has been removed, and there remains behind a thickening of the tissues of the joint with stiffness of the limb. Strapping the joint with long and narrow strips of adhesive plaster, applied equally around the joint and completely encircling it, will prove a valuable expedient for the swelling and puffiness dependent upon debility and relaxation of the ligamentous structure, but caution must be exercised in the adaptation of this valuable means, as much evil will ensue if there exists any evidence of active inflammation going on in the joint at the time of its application. Pressure by compressed sponge and the roller carefully applied is another important means of treatment.

Two interesting cases of white swelling are reported in the

British Journal of Homœopathy, which I will here notice to show the curative virtues of *Silicea* in this affection.

CASE 1. A case of white swelling of the elbow, similar to one described in the Allg. Hom. Ztg. vol. 59, No. 3, and like that also was cured with *Silicea* 15. The incipient anchylosis was continually lessened by assiduously moving the diseased arm, so that the patient, on leaving the hospital, was able to bend the elbow to an angle of 90° and extend it to 160°.

CASE 2. A case entered as white swelling of the knee, in a girl of 19 years, entered Dec. 27, 1859, with a pain in the joint, which gradually got worse as it swelled. Walking at first difficult and afterwards impossible, with constant aggravations of the symptoms; leg so much contracted on her arrival that she could only touch the ground with her toes in walking; knee increased to twice the size of its fellow; skin white and shining; tumor pasty; movement limited; leg flexed and rather thin; temperature of the knee not perceptibly raised; vascular system somewhat excited; sleep and appetite failing. *Silicea* was given as before. In the first week the pain continually abated, sleep and appetite improved. On the tenth day tumor began to soften, and from that time forth such a rapid decrease took place, that at the end of the fifth week there was barely a perceptible swelling; the pain was now entirely gone; the joint itself more movable; contraction of the leg diminished, and by repeated efforts at extension, it was totally removed. The diseased leg increased in size, and on February 23, 1860, she left the institution on foot, with a slight limp, which afterwards left her entirely. If *Silicea* does not produce satisfactory results, recourse should be had to other remedies. The following, given at lengthened intervals and in high potencies, have effected, in the author's hands, excellent cures, viz.: *Antim. crud.*, *Arsenicum*, *Calcarea phosph.*, *Clematis*, *Calc. carb*, *Jodium*, *Mercurius*, *Petroleum*, *Sulphur*, *Kali carb.* and *Kali bichrom.*

When the disease begins in the soft tissues of the joint, *Pulsatilla* or *Hepar sulph.* will be found specially serviceable; but when the bones seem to be first invaded, *Silicea* and *Calcarea phosphorica*, and perhaps other remedies previously mentioned as applicable to caries, will be required. When the disease attacks

the cartilages, producing painful ulceration of those tissues, *Mercurius Corrosivus* will prove eminently curative. When constitutional irritation supervenes, *Aconite* will greatly assist in calming down the excitement, but when a distinctive hectic is set up in the organism, *Phosphoric acid* is more to be relied on. *Sulphur* or *Calcarea* given once a day, or even less frequently, as interpolated remedies, in most cases will prove valuable auxiliaries to the other treatment in combatting constitutional cachexia and invigorating the life force.

If abscess forms, it must be freely opened, as recommended in synovitis, and the joint poulticed with *Calendula* or *Ruta grav.* dressings, until it is thoroughly cleansed of the matter within, when other medicated lotions may be applied either alone or in alternation, as previously advised in abscess of the joint. If all these means fail and the disease marches on, anchylosis must necessarily be the result, the utility of the limb and the patient's comfort depending upon the position in which it is permitted to anchylose.

CHAPTER VII.

ANCHYLOSIS.

Anchylosis is a term employed to designate stiffness of a joint, occasioned by inflammatory action, the limb generally presenting an angular deformity.

Bryant writes:* "The joint is usually flexed, because the flexor muscles are stronger than the extensor; because this position allows, during the hight of the inflammation, the greatest distension of the joint; and because the flexor muscles are supplied by the same nerves as the joints, and therefore contract upon the irritation of their nervous filaments induced by the inflammation of the joints."

---

* Op. cit. p. 117, Lond. ed.

Varieties.—There are several varieties of this affection, based upon, 1st. The degree of motion remaining in the joint; and 2nd. The structures implicated. Under the first head are recognized the *complete* and *incomplete*; there being entire loss of function in the former variety, whereas in the latter a limited degree of motion still exists. Under the second head are included *false*, or *extra-articular*, and *true*, or *intra-articular*, each of which requires special consideration.

False Anchylosis.—In this variety, the inflammation is developed in the tissues exterior to the articulation, as in the tendons, muscles, bursæ and fascia, the ligaments also becoming somewhat thickened and contracted.

Etiology.—The causes conducing to this condition include inflammatory formations consequent on sprains, fractures, dislocations and the like, while tumors, cicatrices, osseous deposits, muscular contraction, and paralysis are also frequently observed as efficient causes in producing the same result.

1. During the *inflammatory* action, bands of lymph are frequently formed within the bursæ mucosæ limiting the play of the tendons, which latter, together with the fascia become retracted and thickened from the fibrinous product, requiring considerable force to effect their extension. False membranes are sometimes formed within the joint, while the more firm and thickened bands within the capsule perform the office of adventitious ligaments.

2. *Tumors* of various kinds developed in direct contact with the articulation or in its immediate neighborhood, may induce stiffness of a joint, in consequence of the change produced in the character of the surrounding structures from continued disuse occasioned by the tumor.

3. *Cicatrices*, resulting from burns and scalds, by inducing violent contractions of the soft parts often produce the most serious deformities and consequent loss of function in the joints implicated.

4. *Osseous deposits* are particularly liable to occur in subjects of a gouty or rheumatic diathesis, the sacro-iliac symphyses and vertebral articulations being the most frequently affected; the ginglymoid joints being next in frequency. In anchylosis arising from this cause there is no fusing together of the contiguous bony

surfaces, such as sometimes occurs in the intra-articular variety, the stiffness being occasioned by osseous bands or bridges stretching across the joint from one bone to the other, thus often completely destroying the action of the muscles and tendons and producing the most serious and incurable variety of this affection. An extensive callus resulting from the repair of fracture in the vicinity of a joint may occasion an equally irremediable difficulty.

5. *Permanent Muscular Contraction* not only interferes with the motion of a joint, but frequently occasions serious distortions, as for example in club-foot, torticollis, etc. This cause is most commonly witnessed in rheumatic patients, those afflicted with gout, and in the case of those suffering from the effects of neglected fractures and luxations.

6. *Paralysis* of the muscles of a joint, by permitting the articulation to remain long in disuse, will often be the means of producing disease of the surrounding tissues, with loss of power and ultimate change in normal character. Thus, for example, the continued inactivity of an articulation destroys the function of the synovial membrane, which eventually becomes converted into tissue of a fibrous or fibro-cellular character, the other structures becoming correspondingly changed and inefficient.

Treatment.—The treatment of extra-articular anchylosis must be directed to the nature of the existing cause, which should be thoroughly understood before any attempt is made to overcome the disease by curative means. Thus, if it is discovered to depend upon contraction of the muscles, tendons, or aponeuroses, whether singly or unitedly, the only remedy in confirmed cases is their subcutaneous division, as will hereafter be pointed out in the treatment of club-foot, etc.

Vicious cicatrices must be excised and a plastic operation performed, by which new and healthy tissue is made to replace the portion removed; this is a procedure, however, not always practicable, and in the event of failure, the limb is made worse by the operation than it was before; hence, considerable judgment must be exercised in the performance of an operation the result of which is often nugatory, if not positively injurious. Osseous bridges or bands may frequently be removed, with much advantage, by means of the bone forceps, saw and chisel, and morbid

growths excised, or, if produced by aneurism, the artery leading to it may be ligated. Paralysis of the muscles may be overcome by those agents recommended under that heading; as local measures, much benefit will accrue from the use of stimulating embrocations, frictions, magnetism, electricity, the cold douche, etc., etc., care being taken to keep up the general health by all those agents that tend to exalt the body physical.

When extra-articular anchylosis has taken place in a faulty position, that is to say, if the knee be bent or the elbow straight, the attention of the surgeon should first be directed to placing the limb in such a position that it will be useful to the patient. To accomplish this, the patient should be put under the influence of an anæsthetic, and the surgeon forcibly extending or flexing the limb as the case demands, it will return to the desired position with loud cracks or snaps. Should any of the tendons in the vicinity of the joint be particularly tense, they should be divided subcutaneously. The inflammatory action that follows this forcible extension readily yields to rest and an external application of *Hypericum*, *Ruta* or *Rhus* lotion and a few doses of *Aconite* internally administered. It is a matter of surprise to witness the small degree of inflammatory excitement that follows this violent extension of an incomplete anchylosed joint. After the restoration of the limb to its desired position, mobility may be increased by friction and passive motion made from time to time.

Langenbeck's plan of breaking up the contractions of anchylosis by force, is to place the patient upon his back and administer chloroform until complete anæsthesia is induced—until, in fact, the *muscles* cease to offer any resistance. As soon as perfect relaxation takes place, the patient is turned over upon his abdomen, an assistant elevates the head to prevent respiration being impeded, and to facilitate the further inhalation of chloroform, if necessary.

If the knee be the joint anchylosed (the most favorable articulation for the operation), the pelvis should be fixed and held firmly by an assistant, when the surgeon will commence gradual flexion, if the joint be in an extended state; or extension, if in a flexed state. The patient must be so placed that the patella of

the bent knee rests on the anterior margin of the operating table, the pelvis being firmly fixed by the hands of assistants. The surgeon then grasps with one hand the femur, just above the popliteal fossa; with the other, the leg just above the ankle, and by more or less powerful alternate flexion and extension, according to the nature of the case, mobility is restored and the normal position of the joint gained. The rupture of the adhesions is effected by a loud crepitus. If one hand of the surgeon is not sufficiently powerful to effect the purpose, both hands should be used and the obstacles overcome, either by strong, gradual pressure, or by sudden jerking movements. The tendency to luxation of the tibia must be guarded against by supporting the joint by pressure directed against the posterior surface of the upper end of the tibia. Still, with these precautionary measures, luxation is often unavoidable, its mechanism depending on pathological conditions of the part which art is unable to change. Reference is made to those cases where, in consequence of large defects of the inferior and posterior surfaces of the condyles of the femur, consecutive subluxation has supervened during the course of the inflammatory disease. A perfect luxation is, in these cases, more probable during the violent forced extension, if the patella is so firmly anchylosed with the femur as to present an invincible impediment to the pressure of the anterior surface of the tibia against its inferior margin. The force to be employed must be determined by the operator, the effort required being in direct ratio with the duration of the disease. When the callus yields to the force imposed upon it, the amount of flexion is preserved until the next trial, the limb being exercised passively during the interval. A great degree of flexion is not to be made at once, but the more cautiously and patiently the limb is managed, the less is the danger of violent reaction and the greater probability of success. When managed carefully the inflammation set up is very trifling, indeed seldom sufficient to retard the cure. Frequently no reaction is perceptible, and every two or three days the patient should be subjected to the same manipulation. Sometimes two or three months are necessary to effect a cure, but in recent and slight cases as many weeks will suffice to restore the functions of the joint perfectly.

Although many years have elapsed between the occurrence of the anchylosis and the attempt at restoration, yet in most cases the callus may be broken up, and the integrity of the joint restored. If the patient be scrofulous, and the anchylosis the result of scrofulous inflammation or ulceration, it is absolutely necessary that this condition be overcome before the operation is performed. A short time suffices to overcome the atrophied condition of the muscles produced by long disuse, and to restore them to their normal vigor.

Fig. 232.

In many cases it will be found advantageous, after the first efforts, to extend the joint by an angular splint, worked by a screw and worm, steadily, until the object is attained, the degree of tension being regulated at will by the patient. There are various kinds of apparatus for fulfilling these indications, the most important of which is Kolbe's contrivance for straightening the knee (Fig. 232), and that of Stromeyer, as modified by Mutter, for rectifying anchylosis of the elbow, as is shown in the accompanying figure 233.

Fig. 233.

The after treatment is based on two conditions: First, to preserve the degree of extension obtained; the second, to use all possible means to restore the normal functions of the joint. After forced extension has been practiced, the muscles have a decided tendency to return to their former condition. Muscles that have been continued in a contracted condition for ten years, are not exempt from this tendency—a fact

directly in variance with the opinion of those who assert that muscles under prolonged contraction utterly lose their vitality.

Treatment.—The remedies of most value in the treatment of this affection are *Bryonia*, *Graphites*, *Lycopodium*, *Rhododendron*, *Rhus tox.*, *Sepia*, *Sulphur* and *Staphysagria*, if employed in the early stage. When suspicion points to essific union, *Phosphorus*, *Mezereum*, *Platina*, *Silicea*, *Staphysagria* and *Sulphur*. When immobility of the joint is produced by rigidity of muscles and ligaments, *Bryonia*, *Rhus tox.*, *Ruta*, *Lycopodium* and *Sulphur* become valuable remedies. If the disease arise from injury, *Arnica* or *Ruta* is the proper remedy. If from rheumatism, the medicines recommended for that affection will be found curative. If from syphilis, *Aurum*, *Corydalia*, *Chimaphila*, *Nitricum acidum*, *Mercurius*, *Platinum*, *Phytolacca*, *Stillingia* will answer the best purpose.

During the time of extension, Hill & Hunt recommend "that the joint should be exposed to hot vapor of water twice a day, if practicable, then lubricated with the oil of the rattle-snake (crotalus horridus). At the same time a dose of the crotalus should be given every two weeks."

For the soreness and pain that follows forcible extension, *Arnica* or *Rhus tox.*, internally and externally, are the appropriate remedies.

True Anchylosis.—True, or intra-articular anchylosis, results from an effusion and organization of plastic matter in the interior of a joint. In the process of change exhibited by the plastic formations, the deposit becomes gradually converted into fibrous or fibro-cellular tissue, then into cartilage, and ultimately into bone, this being the last change effected by the natural process. The extent and nature of the adhesions and transformations necessarily vary according to the peculiar diathesis of the patient and degree of inflammatory action. In some instances only a limited portion of the synovial membrane becomes affected, in which case the adhesions contracted are slight and easily destroyed, the joint regaining its original strength and motion. In other instances the fibrous bands are so numerous as completely to obliterate the synovial cavity, thus rendering it wholly useless. In other cases, again, there is entire destruction of the

interior of the joint, which latter becomes the seat of osseous deposit, the articular surfaces of the bones undergoing complete fusion, the cartilage and synovial membrane having been previously removed by suppuration or interstitial absorption.

The seat of this variety of anchylosis is confined chiefly to the ginglymoid joints, as the knee, elbow, and wrist, though none of the joints are entirely exempt. In rheumatic, gouty, and syphilitic patients, several joints are sometimes affected simultaneously; one case especially having been reported in which a large majority of the articulations were partially or completely anchylosed.

Etiology.—The causes operating to produce anchylosis are varied. Thus, it may arise from any cause, either local or constitutional, which has a tendency to induce inflammation of the synovial membrane.

By far the most prominent of these causes are fractures and dislocations, while every variety of external injury, as blows, wounds, sprains, and contusions; or, the presence of false cartilages may occasion serious inflammation.

Among the constitutional causes are to be named rheumatism, gout, syphilis and scrofula, which not only frequently become exciting causes of themselves, but render cases of arthritis induced by other influences far more disposed to meet with an unfavorable termination.

Symptoms.—Anchylosis is rendered apparent by loss of motion in the various directions corresponding with the normal action of the joint, as flexion, extension, or rotation. The distinctive characters by which the true and false variety may be distinguished are not always well marked; however, in *false* anchylosis the shape of the joint is generally changed; there is more or less pain upon motion, notwithstanding the inflammatory action may have substantially passed away. In *true* anchylosis there is irregular enlargement of the joint and marks of inflammatory action around the part; attempts at motion in chronic cases being generally unattended by pain.

Prognosis.—False anchylosis can generally be overcome by judicious treatment; the joint assuming its original function. In this variety, however, and especially in true anchylosis, the prog-

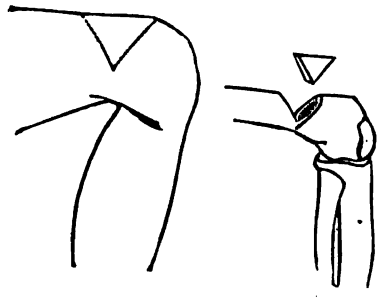
nosis depends in a great measure upon the position of the limb. For example, anchylosis of the elbow joint with the forearm flexed upon the arm, admits of the limb being very serviceable; while anchylosis of the knee joint, with slight flexion, permits the patient to walk with considerable facility; whereas, if the arm were straight, or the leg flexed so as to form a right angle with the thigh, each would be comparatively useless. If in true anchylosis bony union has occurred to any great extent, the articulating surface of the bones being more or less fused together, nothing can be effected without resorting to an operation with a view to the formation of a false joint.

Treatment.—The treatment of true or intra-articular anchylosis, consists in adopting one or the other of the many surgical operations that have been recommended, for restoring the limb to a comparatively useful position. Medicines exert little or no influence over true anchylosis. When, during the treatment of diseases of the joint, it is discovered that there is no possible chance of effecting a cure, but that anchylosis is inevitable, every effort compatible with safety should be made to place the affected limb in a situation most conducive to its future usefulness. Thus, the *wrist* should be straight, the *elbow* bent at a right angle with the arm, and the arm be brought close to the side of the body, and as forward as possible, to enable the patient to feed himself. If it be of the *hip*, the thigh should be flexed a little upon the pelvis, and retained in apposition with the other limb. If of the *knee*, the leg should be inclined somewhat backwards; if of the *ankle*, the foot should be placed at a right angle to the leg. By attention to these several positions the parts will be found to possess most usefulness. True anchylosis is incurable, except by an operation, which consists in cutting out a V shaped portion of bone as originally proposed and successfully executed by Dr. Rhea Barton, of Philadelphia, in 1826. The anchylosis occurred in the hip, and after failing in all attempts to correct the malposition, a crucial incision was made through the integuments over the most prominent part of the great trochanter; the flaps were then raised and the muscles detached from this portion of the bone, making a passage both in front and behind the femur for the easy introduction of the finger.

With a saw constructed for the purpose, the bone was now divided through the great trochanter and a part of its neck in a transverse direction. After dressing the wound, the limb was placed in Desault's fracture apparatus, as modified by Physick, and recovery took place in the most satisfactory manner. In twenty days after the operation, motion was made gently and cautiously in different directions. At first it was repeated every other day, then once a day, for four months, at which time the artificial joint had acquired such a degree of movement as to enable the patient to walk about with the aid of a cane. The foot could not only be rotated but abducted to the extent of twenty inches, and the patient was enabled to carry it forwards and backwards to even a greater extent.

This operation for true anchylosis of the knee joint was also successfully executed by Dr. Gibson, of Philadelphia, in a case of complete anchylosis of the knee, with not a vestige of the soft structures remaining. The operation was performed upon a boy aged seventeen years, who made an excellent recovery with only one half an inch shortening of the limb. The steps of the operation are thus described: In the first place a triangular flap is made of the soft parts in front of the limb, comprising the integuments and extensor muscles, by making two horizontal incisions, one just above the superior border of the patella, and the other two and a half inches higher up, down to the bone. This flap, its broad base being in the inside of the thigh, is then dissected up and held out of the way by an assistant. The next step is to remove a V shaped portion of the femur which can readily be accomplished by a narrow saw, care being taken not to divide the bone entirely for fear of injuring the popliteal artery. The piece being removed, as is represented by Fig. 234, the bone is now fractured by cautiously flexing the limb, which being done, the flap is replaced and secured by sutures. The dressings will be completed by the application of *Staphysagria* or *Calendula* lotions to the part, and the

Fig. 234.



limb placed on a double inclined plane, where it should be retained for ten or twelve days, or until the ends of the broken bone have become enveloped in plastic exudation, when it is placed in the straight position in a suitable apparatus insuring perfect rest. In six to eight weeks the patient is able to resume the erect position and walk about on crutches. The chief interest that attaches to this operation is the removal of the wedge-shaped portion of bone. If too large a portion be removed, union between the divided ends may not take place, and if it be too small, the limb may not be permitted to be sufficiently straightened. In order to avoid these extremes, it is necessary to measure the angle of deformity and then remove a piece of bone equal to the complement of that angle, as is represented in the foregoing Fig. 234.

Dr. J. Kearney Rodgers, of New York, has proposed a modification of this operation by connecting the ends of the bone with silver wire, in the belief that the proceeding would tend to expedite their reunion. There is no especial need of this additional operative procedure, and if the limb is properly preserved at rest during the after treatment, no further coaptation is required.

Excision of Anchylosed Joints.—The practice of excising joints is of a comparatively recent date, and perhaps even now the results of such practice are not sufficiently established to justify the operation. It is unquestionably inferior in most instances to the removal of a V shaped portion of the bone implicated in the disorders, and is infinitely superior to amputation in every case. To a large number of patients the natural limb, although anchylosed, is far superior to the artificial one, however perfect it may become in its appointments. Mr. Ferguson has performed this operation many times with most encouraging success. He has also recorded quite a number of cases, when at the time of the operation the patients were greatly emaciated and prostrated, yet immediately thereafter, the strength began to increase and the general health to improve. The chief object of the operation is to overcome the anchylosis and establish an artificial joint; that such may be accomplished, we have abundant evidences in the "false joints" that sometimes occur after fracture in the continuity of long bones, and which is produced by continued motion at the seat of fracture. There is no reason

why this principle cannot be applied to the excision of joints after the ends of the bones have been sawed off and carefully approximated; the action of the muscles of the limb, if permitted, will produce that active motion necessary to the formation of a new joint. Cases are on record where a tolerably good joint has resulted from the removal of an entire articulation, and in one instance of anchylosis of the elbow joint, following gun-shot wound, which came under my treatment, I succeeded in converting the anchylosed articulation into a false joint with the most satisfactory results. The patient was enabled to attend to his ordinary vocation of driving and taking care of horses almost as well under the new condition of things as before, the arm being shortened only two and a half inches. If this be true of the elbow joint, may it not be equally so of all the other joints of the body?

It seems difficult for some of the profession to appreciate, that in performing the operation of excision of a joint, the articulation need not be necessarily lost, and that a new joint may and will almost certainly be established, if the after treatment is conducted upon the principles already laid down.

Amputation may be demanded in those cases of faulty anchylosis with so much atrophy of the limb as to render it useless, or in those cases in which there is necrosed or carious bones coexisting with anchylosis and rigid atrophy of the muscles of the limb.

CHAPTER VIII.

MOVABLE CARTILAGES.

Movable or False Cartilages are occasionally developed in the various articulations, especially in the knee, elbow, and wrist, where they often seriously interfere with the functions of the joint. In the knee joint, which is their favorite seat, they are exceedingly prone to become impacted between the articular extremities of the bones, thus producing intense pain, which is

liable subsequently to be followed by symptoms of chronic arthritis, or of hydrops articuli.

Etiology.—Various theories have been advanced to explain their mode of development, though comparatively little is known concerning the origin and growth of these foreign bodies. It is probable, however, that they result from the organization of a plastic matter thrown out in consequence of inflammatory action, their peculiar form depending upon the pressure sustained by the surrounding structures. They are generally developed upon the outer surface of the synovial capsule to which they are commonly attached by a sort of pedicle. In this case the compression exerted by the motion of the joint, often causes them to perforate the synovial membrane, and, being thus detached, move freely within the articulation.

They are exceedingly variable in size, number, form and structure. Thus, in the knee they have been found equal in volume to a walnut; though commonly they are not larger than a pea. Their number depends in a great measure upon the size of the concretion—when large not more than one is commonly found, whereas in other instances twenty, thirty, and in one case sixty of these bodies were found. In shape, they may be irregular, rounded, flattened, convex on one side and concave on the other, or of a lenticular form, as represented in Fig. 235. During the earlier stages of their formation, they are of a fibro-cartilaginous nature, subsequently exhibiting every degree of consistence ranging from cartilage to that of osseous matter.

Fig. 235.

Loose articular concretions.

Symptoms.—The symptoms indicating the presence of movable bodies within the joint are, as a general rule, sufficiently well marked, especially when occurring in the knee, to enable the surgeon to determine without difficulty the true nature of the affection. If complicated with chronic arthritis, however, the most careful examination will not always suffice to establish beyond doubt the fact of their existence. Provided the concre-

tion be large, it can be detected beneath the integuments by manipulating the parts with the fingers, whereas, if the joint be greatly tumefied and the bodies are small, detached and capable of becoming wedged in between the opposing surfaces of the joint, the chief reliance will have to be placed upon symptoms similar to the following: The patient is suddenly seized, while standing or walking, with sharp, cutting pain, which is often so severe as to cause fainting; motion of the joint is greatly impeded, while the pain is renewed or greatly aggravated by attempts to move the limb in particular directions; the joint will become enlarged, tender, and the seat of pain more or less constant and severe. Violent synovitis frequently ensues, with interstitial deposits into the surrounding textures; the ligaments become relaxed, while the functions of the joint are permanently interfered with to a greater or less extent. Not infrequently, however, cases occur in which the foreign substance occupying a particular part of the joint, is thus rendered comparatively harmless, notwithstanding it can be distinctly felt and, perhaps, moved freely from one point to another. In such instances, it is very evident that the concretion is extremely liable to occasion trouble at any time.

Diagnosis.—The most important diagnostic signs are the suddenness with which the joint is deprived of its use, the severity of the concomitant pain, the ability of the surgeon to see, feel and push about the concretion, and the facility with which the patient can generally relieve himself by his own efforts. The chronic nature of the disease, the absence of external injury, and the frequent recurrence of the symptoms from the most trivial circumstances, afford important collateral evidence of the character of the affection.

Prognosis.—The nature of the concretion being such as not to admit of its absorption, while the danger attending an operation for its removal is so great as seldom to justify the surgeon in using the knife, the prognosis must necessarily be guarded.

Treatment.—The local treatment consists in supporting the joint with an elastic bandage or knee-cap, properly adjusted and fitted to the limb, so as to limit its movements and prevent the liability to the recurrence of attacks of pain. Mr. Hilton advises

the fixation of these bodies in contact with the synovial membrane by adhesive straps, applied externally, in order to produce its absorption without the risk of an operation.

If the foreign body produces great and frequent suffering, to an extent that interferes with the vitality of the limb, especially if it be of a large size, an operation may be performed for its removal—provided the joint be not in a state of irritation from its impinging upon the synovial membrane. After subduing all irritation caused by its pressure, an operation may be performed in the following manner: The patient must first make those movements by which he usually causes the body to be fixed in the joint. The surgeon now feels for the cartilage; if in the knee, he should push it to one side of the patella, where he fixes it firmly between his thumb and fore finger, then, drawing the skin covering the tumor, so as to make it tense, he cuts directly down upon the foreign body with an incision long enough to permit its escape. The wound should then be closed with a piece of adhesive plaster and the parts covered with a lotion of *Calendula* or *Staphysagria* as the surgeon may select. The limb should then be placed upon a splint or pillow, and kept perfectly at rest until the wound has healed.

It is rare that severe inflammation follows this operation, but when it does occur it must be treated on the general principles already given under the head of synovitis. Acute synovitis has occasionally followed this operation, terminating in suppuration of the joint, requiring amputation, or ending in anchylosis—hence great caution should be exercised, not only in the operation itself, but also in the after treatment. To obviate this disastrous termination, it has been proposed by Mr. Goyraud, of Aix, and Mr. Syme, of Edinburgh, to remove these movable bodies by a subcutaneous incision. This is accomplished by passing a tenotome obliquely under the skin, after fixing the tumor in the manner above described, dividing the synovial membrane freely, and squeezing the cartilage into the cellular tissue outside the joint, where it is permitted to remain until the incision in the synovial membrane has healed, when it may be removed by a new incision or be taken up by the slow process of absorption. Another operation, which is a modification of the first, consists in fixing

the loose cartilage as described, and dividing the capsule subcutaneously over it; the foreign body is then pressed into the incision thus made, and there retained by adhesive straps and compresses until absorption of the foreign matter takes place. In most cases where either of the two last named operations have been performed, the success attending them has been most satisfactory. The remedies said to possess curative value in this affection are *Aurum*, *Calcarea carb.*, *Jodium*, *Kali hyd.* and *Silicea*, but of their success in the treatment of such cases I have no experience.

Fibrous tumors occasionally have their seat in the synovial membranes of the large joints, but particularly in the knee. Several sometimes exist together, varying from the size of a pea to that of an almond. Prof. Gross removed one of these growths from the knee which had attained the size of a pullet's egg. The patient had been afflicted with synovial irritation for several years, attended with partial anchylosis, pain and tenderness, which were always aggravated upon the slightest exertion. The wound healed rapidly, and the functions of the joint were much improved by the operation.

The tumor was of a pale, greenish color, extremely firm and tough in consistence, smooth, glistening, and somewhat vascular on the surface, and of a distinctly fibrous structure.

CHAPTER IX.

COXALGIA.

Coxalgia, Morbus Coxarius and Hip Disease, are terms indiscriminately employed to designate a peculiar form of inflammation commonly resulting "in suppuration within the joint, softening and ulceration of the ligaments, with caries and necrosis of the bony surfaces, and luxation or anchylosis of the head of the femur." The disease is entirely distinct from arthritis, arising in consequence of a rheumatic or gouty diathesis, and is almost invariably encountered in patients of strumous habit.

Coxalgia is a disease confined almost exclusively to childhood and early youth, being most frequently met with from the third to the seventh year, and immediately before the age of puberty, while it very seldom occurs after the twentieth year.

Etiology.—The causes of hip disease are generally very obscure, the affection often arising without the previous occurrence of the least circumstance to which the development of the malady could be attributed. Strains, contusions and wounds have sometimes been regarded as exciting causes, but that severe injuries of this nature are frequently sustained by the hip joint without the supervention of the disease, together with the fact that it is met with independent of such causes, is quite sufficient to prove them exceptional. It is, however, evident that whatever has a tendency to produce serious derangement in the system and impoverish the blood of individuals predisposed to the affection, would act as a cause to favor its occurrence—such, for example, as eruptive fevers, copious hemorrhages, improper food, vitiated atmosphere, exposure to cold, and the like.

Symptoms—In the *first stage* of the disease, the symptoms are not clearly marked, in view of which fact the diagnosis is frequently erroneous. In general, however, the patient first exhibits a peculiar *awkwardness of gait*, walking in a *hopping*, *shuffling* manner, with a tendency to *drag* the foot; in standing, there is a disposition to rest the weight of the limb upon the toes, having the knee slightly flexed and abducted. There is also slight pain, generally referable to the inside of the knee joint, while exercise is always succeeded by more or less fatigue. This condition may continue for a considerable time, weeks and even months, without any sensible aggravation.

During the progress of the disease, however, the pain becomes more intense, sometimes affecting the hip itself, sometimes the groin, or, perhaps the heel and side of the foot, though commonly the knee is the favorite seat. It is greatly increased by motion, is worse at night and in damp weather, and often assumes a decidedly neuralgic character. Occasionally, also, the pain exhibits itself in regular paroxysms, the intervals affording comparative rest and comfort; and especially is this the case, provided the patient is subjected to malarial influences.

The pain in the knee has been ascribed to a variety of causes, as, for example, to the irritation sustained by the obturator or other nervous cords; to disease of the long head of the rectus femoris; to inflammation of the cancellated structure of the femur; and to the stretching and compresssion of the internal lateral ligament of the knee joint.

None of the attempted explanations, however, are wholly satisfactory, and indeed, the question is of no practical moment; although the *fact* that the pain almost invariably chooses this situation, affords a symptom of great value in assisting the surgeon to form a correct diagnosis.

The *second stage* now supervenes, characterized by an increase of pain in the hip and knee, flattening of the buttock, effacement of the gluteo-femoral crease and apparent shortening of the limb, with spasmodic twitching and wasting of its muscles. The *pain* experienced principally in the knee or at some other point remote from the immediate seat of the difficulty during the first stage, now invades the joint and is greatly increased in severity, and may be particularly aggravated at night, depriving the patient of rest; being at times sharp, cutting and erratic, at others, dull, heavy and continuous. The hip becomes exceedingly tender and somewhat tumefied, especially on its anterior and internal surfaces, and hence pressure on the groin over the psoas muscle or near the head of the pectineus, greatly augments the pain; while pressure on the great trochanter, slightly striking the knee or heel, or producing motion of the limb, tends also to increase the suffering.

Spasmodic action of the muscles of the hip, leg, and especially those of the thigh, is particularly apt to occur during this stage, and is frequently so violent and persistent as to afford a formidable source of additional suffering.

Physical signs indicating the progress of the disease now become apparent, among which may first be noticed a change in the shape and size of the nates. The glutei muscles of the affected side become wasted by absorption, thus occasioning a flattening of the posterior fold of the buttock, which assumes a broad and lengthened appearance; while the gluteo-femoral crease becomes either wholly obliterated or partially effaced, changing

from a transverse direction to a line approaching the perpendicular. Fig. 236.

The muscles of the entire limb also, and particularly those of the thigh, become atrophied and wasted, by an absorption of the intermuscular and subcutaneous adipose tissue.

The *apparent elongation of the limb*, which is rarely so slight as to escape detection, is perhaps the most constant and important of the physical phenomena accompanying the development of the malady. Fig. 236. The lengthening varies from one half inch to two inches and a half, while the limb is flexed, abducted and rotated outward, as indicated by the eversion of the foot. This apparent elongation is occasioned by a tilting of the pelvis, by which means the weight of the body is supported by the sound limb, and the muscles of the affected side, being thus relieved of their tension, the pain is in a measure mitigated.

Fig. 236.

A full view of the back and buttock of the right side showing the wasting of the glutei muscles and the change in the line of the nates.

The *constitutional disturbance* during the continuance of this stage, is generally marked, though by no means severe in the great majority of cases. Toward evening the patient will be more or less feverish, unable to sleep, and perhaps quite thirsty. The bowels will be somewhat constipated, urine high-colored and scanty, countenance anxious and of a sallow hue, while there is emaciation with loss of strength. Occasionally, however, the general health of the patient remains comparatively good.

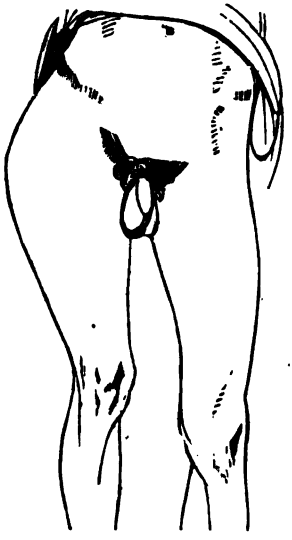
In the third stage the symptoms are aggravated and unmistakable in their character. The parts in the immediate neighborhood of the articulation become greatly swollen; the skin is shining, congested and œdematous, and the subcutaneous veins are enlarged and tortuous. The pain becomes greatly aggravated

by the pressure of pus upon the inflamed and highly sensitive structures, while the least motion or manipulation of the joint, produces the most excruciating suffering. The pus can be more or less readily detected by percussion, and if left to itself may obtain vent directly over the joint, in the gluteal region, at the external part of the groin, upper and outer aspect of the thigh or at its inner surface. The pus is also particularly liable to travel in different directions under the fascia of the thigh, forming troublesome sinuses. Not infrequently, too, it escapes internally, the ulceration extending to and perforating the rectum, bladder, or vagina. The discharge is generally thin, ichorous, of a greenish tinge, and contains flakes of lymph, clotted blood, and perhaps, portions of carious or necrosed bone.

After the formation of abscesses and the escape of their contents, the health of the patient rapidly gives way, a train of symptoms succeeding, indicative of exhaustion and hectic, such as emaciation, night sweats, and colliquative diarrhœa.

Actual shortening of the affected limb now occurs, and constitutes a marked deformity, Fig. 237. The degree of shortening, however, is of very great variation, in some cases scarcely exceeding an inch, while in others it is not less than three and a half or four inches. It is occasioned in consequence of more or less complete destruction of the head and neck of the femur, which permits the superior extremity of the bone to be drawn upward and inward and to become ultimately attached to the upper portion of the acetabulum. This, together with the elevation of the pelvis on the diseased side, which of itself

Fig. 237.



A front view in hip disease of the right side, showing the shortening, inclination of the pelvis, and flexion of the limb.

is quite sufficient to constitute a difference of one or two inches in the natural position of the limb, will account for both the real and apparent shortening, without supposing the existence of a complete or even partial dislocation. Notwithstanding the fact that nearly every writer upon hip disease has laid stress upon luxation of the femur, as the principal cause of the deformity, still the positive evidence collected in favor of this supposition is wholly overbalanced by facts proving it to be, on the contrary, an extremely rare occurrence. Gross writes: "A true luxation, such as occurs in the normal state of the parts, is in fact impossible, from the very nature of the morbid alterations experienced by the superior extremity of the bone in question, its head being generally completely destroyed, and its neck in a great measure. Now, during the progress of the disease, this remnant of the neck, which is usually of a rounded, conical shape, and frequently not more than three-quarters of an inch in length, if indeed so long, ordinarily places itself over the acetabulum, to the margins of which, and to the adjacent parts, it becomes, in the event of recovery, ultimately united. That it is occasionally drawn up above this point, especially where there has been complete destruction of the upper border of the acetabulum, backwards towards the sciatic notch, forwards upon the pubic bone, or downwards and forwards into the thyroid foramen, does not admit of doubt. Dislocation, however, in most of these directions, can take place only in those cases where there has been extensive suppuration with separation or destruction of the soft parts, allowing the superior extremity of the bone to move about and thus seek, as it were, a new position. The upward displacement is, undoubtedly, the most frequent, but even this must be extremely rare." *

The *change of position* now exhibited by the limb is characteristic and generally very different from that assumed in the early stage of the disease. This is due to the absorption and partial or complete loss of function of the external rotators of the thigh, in consequence of which the thigh is semiflexed on the pelvis, the leg bent upon the thigh, and the whole limb adducted and turned inwards.

* Op. cit., vol. 1, p. 1018 *et seq.*

Fig. 238.

The shortening of the limb may arise, in very chronic cases, from general atrophy of the extremity, consequent upon disease; and this no doubt in time influences its condition in all cases. The head of the bone in some instances is absorbed while in others it is dislocated upon the dorsum of the ilium, which may be felt through the thin and weakened muscles in its new situation; or, it may be felt roughened and lying at the bottom of a cavity in a carious condition, as represented by the small figure in the accompanying plate 238.

Diagnosis.—As the symptoms indicating the development of coxalgia are not always well marked, the disease is liable to be confounded with several other affections sometimes attacking this joint. Those which are most likely to obscure the diagnosis are *rheumatism*, *psoas abscess*, *periostitis* of the great trochanter, *lateral curvature* of the spine, together with affections of the knee, sprains and contusions. It can ordinarily be distinguished from rheumatism by the presence of pain in the knee, increase of pain at night, great aggravation of suffering from motion, pressure, or percussion, together with a marked change in the position and shape of the limb. The diagnosis is further assisted by observing that in rheumatism, the attack is generally attributable to cold or wet; the pain confined principally to the front of the thigh, is heavy, dull, or aching; the gait is limping; the pelvis is elevated on the affected side, while the foot is strongly *everted*

The pain and stiffness felt in the morning are generally mitigated by gentle exercise and is sure to return in the evening, while the co-existence of rheumatic symptoms in other parts of the body and the rare occurrence of this affection in children, will usually be quite sufficient to establish a correct diagnosis.

Psoas abscess, which might be mistaken for hip disease, can readily be distinguished from the latter affection, by the location of the pain, which is seated in the loins and greatly aggravated by the erect posture; by the situation and character of the swelling, which is generally observed above Poupart's ligament, is sometimes reducible by pressure or change of position, and receives an impulse upon any sudden action of the abdominal muscles. The date of its occurrence also affords evidence of its character, as it is rarely met with previous to the age of puberty.

Periostitis of the great trochaner simulates the symptoms of hip disease in several particulars, when occurring in patients of a gouty or rheumatic diathesis. The distinguishing points of difference, however, are "persistence of the gluteo-femoral crease, the co-existence of rheumatism or gout, in other regions, and the fact that the disease usually occurs later in life than coxalgia." *Lateral curvature* of the spine, which frequently produces apparent shortening of the limb, with rigidity of the muscles, neuralgic pains and tenderness of the hip may be mistaken for symptoms of hip disease, but the existence of the spinal affection with the absence of spasmodic action of the muscles, and the relief of pain by pressure, will usually indicate the true nature of the difficulty.

The affections implicating the structures of the knee, are so constantly attended by positive signs of diseased action in that locality, that the danger of confounding them with coxalgia, is commonly very slight.

The symptoms arising from severe sprains and contusions are often of a character closely resembling the group manifested in hip disease, but can be distinguished from the latter by observing the history of the case, together with the absence of pain in the knee, and the greater freedom of motion enjoyed by the joint. In case of injury, also, the constitutional disturbance is commonly slight.

Hence, in view of the obscure nature of the symptoms, exhibited during the incipient stages of hip disease, together with the fact that a variety of other affections simulate it in important particulars, it becomes a matter of moment that a system of examination be adopted which shall, in all instances, disclose the true character of the case. To this end, the surgeon is first to acquaint himself thoroughly with the history of the case: the symptoms present are then to be carefully noted, and the examination repeated frequently, until the diagnosis is clearly apparent.

In order to arrive at a knowledge of the physical signs, the patient should be divested of all clothing, and the changes produced in the relative position of the parts, together with their size, shape, attitude and length, taken into consideration. After completing the examination of the patient, in a standing posture, he should next be allowed to assume a horizontal position, that the parts may be conveniently manipulated in order to ascertain the degree of tenderness and pain experienced by rotating, flexing and percussing the limb. Among all the data to be collected, however, from the most rigid investigation, the pain in the knee is the most constant and reliable; and in conjunction with other valuable symptoms that can usually be gleaned, such as increase of pain on pressure, limping, &c., may be regarded as pathognomonic. The most valuable of the physical signs is exhibited in the circumstance that the thigh of the affected limb and the spine cannot be made to occupy the same plane at the same time, owing to the partial flexion of the thigh upon the pelvis. Respecting this position, Bonnet writes, "it must be admitted that flexion of the thigh is due to its being a natural position under most circumstances, when the hip joint is distended by serum or pus; that abduction is the necessary support to a limb when a patient lies on the back, and that flexion and abduction give the greatest capacity to the hip joint. Hence their presence indicates inflammation with effusion into the joint, or the first and second stage of hip disease, in which they are mostly found. Flexion of the thigh with apparent elongation of the limb, and an everted foot, is due to an inclination of the vertebral column and the pelvis on the affected side, as this position takes the weight of the body off the femur of the patient in standing, and also relaxes

the psoas muscle, which passes over the front of the joint while he is lying down, thus relieving the latter from anterior pressure. Flexion with adduction of the thigh and inversion of the foot generally accompanies the last of the second stage and the entire of the third period, and in health distends the capsular ligament at its superior and posterior part, where it supports the head of the femur."

Prognosis.—The prognosis of hip disease will depend much upon the constitutional vigor of the patient and the degree of advancement which the malady has attained. If early subjected to appropriate treatment, this affection will commonly be found as amenable to the action of remedial agents as other forms of chronic inflammation, and recovery may be complete. Provided, however, the disease has existed for a considerable time, and the second stage be present, permanent weakness of the joints, together with partial anchylosis, will frequently result, notwithstanding the best directed efforts of the surgeon. The cure is necessarily slow in any event, and particularly so if the patient be affected with any constitutional taint. In case the third stage of the disease supervenes, with disintegration of the bony structures, formation of abscesses, and hectic irritation, the prognosis becomes exceedingly unfavorable, loss of the functions of the joint being inevitable, while serious apprehensions can often be safely entertained respecting the patient's life. In general, however, it is to be remarked that the application of the more recent improvements in the mechanical appliances employed in the treatment of this affection enables the surgeon to predict a far more favorable result than was possible in former times.

Treatment.—In the early stage of coxalgia, when the patient first complains of pain in the knee, *Belladonna*, *Bryonia*, *Mercurius*, *Colocynthis*, *Hepar*, *Pulsatilla* and *Rhus*, will be found exceedingly efficacious remedies, and, given in accordance with the characteristics of each case, will oftentimes control the disease and conduct it to a favorable termination. If the affection has been the result of mechanical violence, injuring the ligamentous structure of the joint, *Arnica*, *Hypericum*, *Rhus* or *Ruta* lotions constantly applied to the part will produce most beneficial results. *Aconite* may be given internally if any vas-

cular excitement accompanies the disordered condition of the joint; *Pulsatilla*, *Bryonia*, *Belladonna* or *Rhus*, if there exists little or no systemic reaction. These means, with assistance of perfect rest of the limb, will generally suffice in a few weeks to arrest the progress of the disease in the first stage, and prevent it from passing into the second or more inflammatory stage. If not, and the disease advances gradually, *Mercurius* should be resorted to, which often proves a specific in the earlier stages of the affection, and especially in persons of a scrofulous diathesis, uncomplicated with mercurial poison. In such cases I have found that a dose of *Calcarea carb.* 30th, given at night just previous to the patient's retiring, exercises a marked control in staying the ravages of this affection.

Mercurius is particularly useful when the disease sets in very suddenly, especially in children with pale, bloated countenance, suffering little or no pain in the hip, and only complaining of a feeling of stiffness or lameness in the limb, as shown by continual limping.

Belladonna, in the earlier symptoms, or when there is considerable burning, stinging pain, and inflammation is present, with heat about the joint, aggravated at night, with inability to sleep.

Colocynthis, when there is a fullness or tension in the neighborhood of the joint, accompanied with severe grinding pains—darting pains extending from the hip to the knee. Prof. R. Ludlum, of Chicago, has derived much relief from the use of this remedy. "It seems," he says, "to have a relation to periosteal rheumatism about the hip." In a case of necrosis of long standing, *Colocynthis*, 3rd, every hour, or even every half hour, when the pains were most severe, controlled the severe nocturnal pains better than any other remedy.

Pulsatilla, is a valuable agent, especially in children, when there are nightly exascerbations, with pale and delicate skin.

Bryonia is valuable when the pains in the hip joint are tearing and darting, increased by pressing the head of the bone inwards and accompanied with rigidity, tension and stiffness of the muscles—pain increased by motion.

Calcarea carb., in scrofulous persons in whom the disease has

appeared without assignable cause; the patient complains of little or no pain, drags his limb rather than lifts it; foot turned outwards, and leg longer than its fellow; best adapted to the second stage; glandular swellings in the neck; hard and bloated abdomen with inclination to diarrhœa, especially towards evening.

Sulphur is also valuable in chronic and scrofulous subjects, who have been troubled with eruptions, when there is considerable prostration, profuse sweats and sensitiveness to the open air.

Silicea is another remedy of great efficacy in scrofulous constitutions, especially in the later stages of the disease and during the suppurative stage.

China is demanded in all cases where the vital forces are prostrated and much emaciation ensues from the copious discharge of pus.

Arsenic, *Iodine*, and *Calcarea phos.*, may be employed in the second and third stages, when the emaciation is extreme, either alone or in alternation, as demanded by the nature of the case.

Apis mel., *Hyosciamus*, *Kali carb.*, *Kali hydriod.*, *Hepar sulph.*, *Phosphorus*, *Lachesis*, *Lycopodium*, *Bryonia*, *Sepia*, *Mezereum*, *Staphysagria*, and *Silicea*, are also useful during the various stages of the disease, and may be employed according to their respective indications.

When the disease partakes of the acute *arthritic* kind, the patient must be immediately placed in bed and the remedies for rheumatic arthritis given precisely as recommended for that disease. The inflamed joint should be kept constantly moist with *Calendula*, *Hypericum*, *or Ruta* lotions, and be comfortably arranged on pillows, or fitted upon a soft leathern or paste board splint well padded, in order to prevent the painful startlings of the limb. *Aconite*, *Gelseminum*, or *Cimicifuga*, should be given according to circumstances until the acute symptoms have subsided, and in other respects the treatment will be the same as recommended in rheumatic synovitis. When the pain is very severe great relief will sometimes be experienced by the application of hot poppy fomentations to the joint, whatever may have been the duration of the malady. In the early stage of the disease, when the pain is very severe and difficult to be controlled by internal medicine, I have found great benefit follow the use of

local anæsthesia as shown on page 148, vol. 1. Either the rhigolene or sulphuric ether may be employed as best meets the indications of the case, and the Richardson apparatus is a very convenient one with which to use the atomized spray. This instrument as well as the process of its use is fully pointed out on page 147, vol. 1, to which the attention of the reader is referred.

When the treatment of the case is begun, the first and most essential element in its management is rest, absolute rest, not only of the limb but of the whole body. This must be expected of the patient throughout the whole course of treatment, and its importance should be explained to the friends or family of the patient at the very beginning of the case.

When the disease becomes chronic, or assumes a subacute condition from the first, a different line of treatment requires to be pursued. In such cases, repose and perfect immobility of the limb is not so much demanded as in the acute variety. The principle to be adopted is, to prevent the head of the femur from pressing against the acetabulum. This was formerly done by keeping the patient in bed and applying extension and counter-extension, by means of a curved, angular or straight splint. The principle of rest, by strapping the patient in a horizontal position as a means of cure in a chronic inflamed joint, has been proven by Bonnet and others, to be erroneous and productive of unsatisfactory results. Hence it is the better plan in the *chronic* variety, or even in the *acute*, when the inflammatory symptoms have been subdued, to employ those appliances that have a tendency to draw out the head of the femur from the deep surface of the acetabulum and at the same time to permit gentle exercise of the joint, a certain degree of motion being absolutely essential to the proper circulation and the prevention of inflammatory suffering, or the so-called ulceration of the articular cartilage. To accomplish this, Dr. H. G. Davis, of New York, after twelve years of patient study, has invented the most perfect system of mechanical apparatus that has ever been employed for the treatment of this disease. Dr. H. H. Smith, of Philadelphia, adds his indorsement of the apparatus, after having employed it, he says, for "two years with the most satisfactory results."

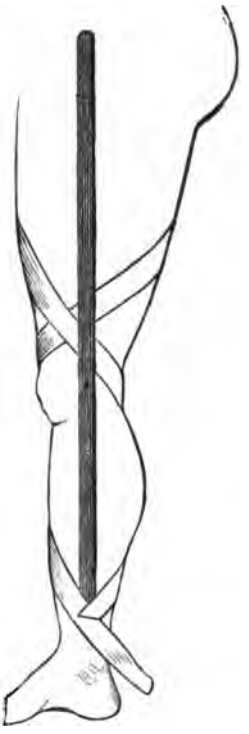
The plan of mechanical treatment, as recommended by Dr. H. G. Davis, is appended in full.

"**On the Mechanical Means adopted in the Treatment of Morbus Coxarius**, by H. G. Davis, M. D., New York.—The several parts employed in this plan are four strips of adhesive plaster, as hereafter described, a roller to confine them to the limb; firm webbing to be attached to the lower end of the adhesive plasters when upon the limb; a cord, pulley, and weight, for extension when upon a bed or couch; and a corrugated steel splint, with a perineal band, composed of two parts—an inelastic and an elastic—arranged in a peculiar manner, so as to keep up extension while the patient takes exercise within the house or in the open air.

When called to treat a case of morbus coxarius, bring the tibia in a line with the femur, but attempt no change in the direction of the latter if it is not parallel with the body. If the femur is flexed upon the pelvis, the body should be raised until the limb will lie extended upon the mattress or couch. Adhesive straps should then be placed upon each side of the limb, in the following manner: First, double over one inch of each adhesive strap designed for the sides of the limb, bringing the adhesive surfaces in contact for the purpose of increasing the strength of the part, to which a firm inelastic webbing, six or nine inches long, should be stretched. The plaster for the outside of the limb should then be applied to the folded end mentioned, at a point one inch above the external malleolus, and extended to the region of the great trochanter; that upon the inside, from one inch above the internal malleolus to within one inch of the pubis. Upon the lower end of the adhesive strap, on the outside of the limb, commence with a narrower and longer one, and run it spirally around the limb until it reaches the upper end of the longitudinal straps; another should then start from the same point upon the outside of the limb, but wind in the opposite direction. These spiral strips accomplish a twofold purpose: they connect the outside longitudinal adhesive plaster with that upon the inside of the limb, so that any extension made upon the outside plaster is shared by that upon the inside. This arrangement also secures the bottom of the outside longitudinal plaster from being displaced laterally when the splint is applied, always retaining it in a line with the limb. The width of these plasters varies from an inch and a

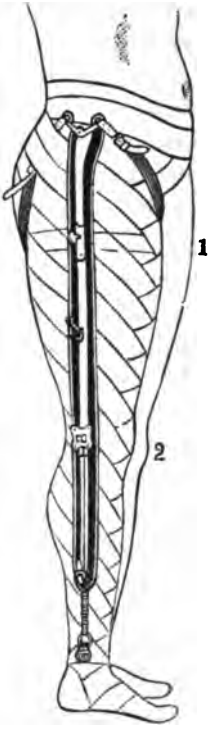
quarter to two inches and a half, according to the size of the patient, Fig. 289, the latter being wide enough for a patient of some years.

Fig. 289.



A side view of the adhesive straps as applied to the limb, showing their course and relation to the splint. The ends of the straps have not yet had the webbing sewed to them, but are represented loose. (After Davis.)

Fig. 240.



A three-quarter view of Davis's splint as fully applied to the limb. This splint is placed outside the bandage, and held in position by the extending and counter-extending bands at its two extremities, as well as by the straps shown at 1, 2. (After Nature.)

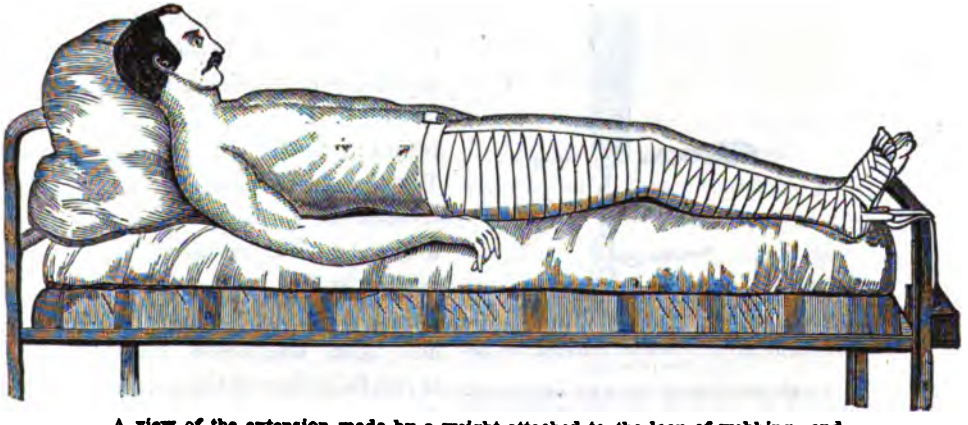
When the extension is made by the application of the splint, it is always by the outside strip, and upon the outside of the limb; at other times, as when the patient is in bed, and the weight is used, it should be made from both sides, by tying the two pieces of webbing together (that from the inside and that from the outside strap) in a loop below the sole of the foot, the cord to which the weight is attached being made fast to the looped webbing. The latter mode of extension supports the sides of the foot equally, and is, therefore, preferable when the patient is upon the bed or couch, and without the splint.

Before proceeding further, a word may be said upon the char-

acter of the adhesive plaster to be used for this purpose, as that ordinarily used for dressing wounds will only disappoint the surgeon. It should be spread upon twilled goods, as they are more elastic, and when the extension is made, the parts first affected will yield until the whole surface of the plaster bears a portion of the draught; whereas plaster upon plain cloth draws only in a straight line, and therefore is only applicable to an even surface.

The material of the plaster should not only be good, but it should have been spread upon the cloth for at least one year, and it is still better if two years old; age oxydizes the oil, rendering it resinous, so that the oily secretions from the skin do not readily soften it. Plaster of this description has remained upon an adult for seven months, sustaining a weight of twelve pounds every night, and not unfrequently during the day a considerable portion of the entire weight of the body.

Fig. 241.

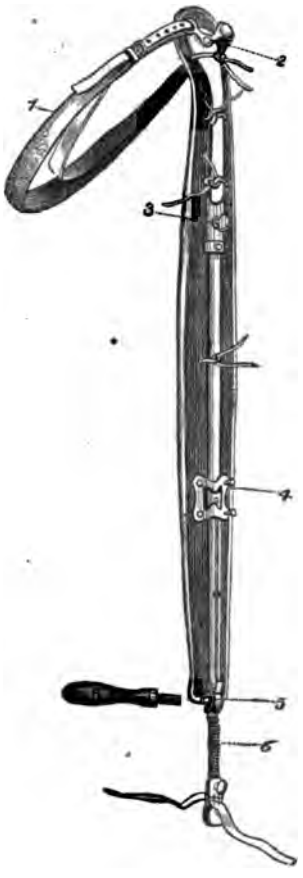


A view of the extension made by a weight attached to the loop of webbing, and applied whenever the patient is in bed. (After Nature.)

After the application of the adhesive straps in the manner described, the limb should be covered with a spiral bandage from the foot to the pelvis, to secure firm adhesion of the plasters, also to prevent their edges from being raised by coming in contact with the clothing, Fig. 241, or by the hands of the patient during sleep. This bandage should be applied to the limb for

some hours, with the patient warm in bed, before any traction is made upon the adhesive straps, so that the latter may become firmly adherent to the limb. After this time has elapsed, a weight, varying from two to six pounds, according to the strength of muscle and the sensibility of the joint, may be attached to the webbing fastened to the ends of the adhesive straps upon each side of the limb, by tying the webbing in a loop and attaching to it a cord, so that it may run over a small pulley or block, secured to the foot of the bed or couch, or over the round of the bedstead, the top of the pulley being a little above a line with the centre of the limb, Fig. 241. This weight should be increased from day to day, until a general sensation of fatigue is felt in the entire limb to an unpleasant extent, and then diminished until it just falls short of this point. The extension should be first made at that angle with the body held by the limb, the shoulders being elevated by pillows. As the tenderness of the joint subsides, the body should be gradually lowered until it is brought in

Fig. 242.



A VIEW OF DAVIS'S CORRUGATED STEEL SPLINT FOR HIP DISEASE.

1.—Elastic perineal band for counter-extension, the outside band being an additional support.

2.—The lever joint to permit the play of the counter-extending band as the patient walks.

3.—A sliding joint to permit the lengthening or shortening of the splint. The thigh circular strap is attached to the pin in this joint, to hold the strap in position.

4.—A piece to receive the band that surrounds the knee.

5.—A screw moved by a handle, and extending the bar to which the extending band is buckled.

6.—The extending bar racked so as to be moved by the screw in extension.

a line with the limb. When this is effected the splint can be applied, and the patient put upon crutches and permitted to exercise.

When the splint is applied,the piece of firm, strong webbing fastened to the outside adhesive strip passes over the lower end of the splint, and is inserted into a buckle on its outside, near the joint; the inside band is then simply curled around the ankle.

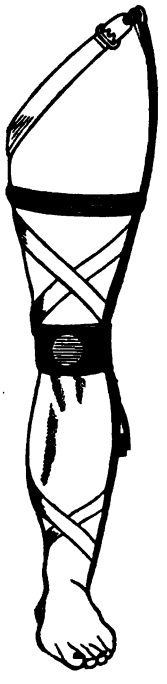
The counter-extension is now ready for the splint. This is made of steel, of sufficient width and thickness that, when corrugated as it is in the splint, it will sustain the weight of the patient without yielding; and it is surprising how little thickness of steel it requires to fulfill these indications when put into the corrugated form. A strip, one inch and a half wide, of No. 16 rolled cast-steel, when corrugated, will sustain, endwise, the weight of an adult without yielding.

The splint is represented in the cut, Fig. 242 If the webbing attached to the plaster is wider than the bottom of the splint, it will contract over the corners sufficiently to retain the splint in its fold. To make it still more secure, the lower end of the splint can be cut into, forming slight grooves, into which the threads of the webbing will draw, and thus prevent displacement. Just below the joint, in the splint (6), is the button for the attachment of the buckle, before mentioned. Quite at the top, and inside of the splint, is an eye, through which runs a lever, to which are attached the two ends of a perineal or counter-extending band, when the splint is applied to the patient; this lever allows the upper portion of the splint to traverse back and forth without disturbing the perineal band. All of that portion of the splint that passes above the hip joint has a motion, of which the joint is the centre, the perineal band being thus undisturbed by any motions of the limb, and all irritation from friction avoided. Between the splint and the limb is placed a flat piece of padded leather, to prevent irritation. The perineal or extending band is a very simple though a very important contrivance. It is so arranged that any amount of extension can be made, yet, when the patient steps upon the limb, it yields no further.

There is, first, an elastic band, one or one and a half inches wide, made of the very best rubber, or rubber webbing, to which

two buckles are attached, one at each end. In addition, there is a piece of inelastic webbing that is from eight to twelve inches longer than the elastic band mentioned; this passes through the buckles in such a direction that, when extension is made upon each end, the buckles take hold of the webbing and confine it. By this arrangement of the two bands they can be buckled at different lengths; by leaving the outside inelastic band loose between the buckles, any draught applied at the ends of the inelastic will be communicated to the elastic band, extending it until it is of the same length as that portion of the inelastic band contained between the buckles; then the latter will prevent any further extension. It will now be perceived how a certain amount of extension can be kept up; yet when any additional labor is thrown upon the splint, as when the patient leans upon the limb, it will yield no further. The splint is also secured to the limb by a strap at the knee, Fig. 243, as well as in the middle of the thigh. The loose ends of the inelastic webbing may be folded back upon themselves, and introduced into the buckles. Both ends of the perineal band are secured to the buckles after the latter is placed in the eyes of the lever at the top of the splint, the whole forming a loop that can be put upon the limb over the foot without disturbing any part. For a cushion beneath the perineal band we may use old table linen, or old napkins that are soft; they should be folded an inch wider than the perineal band, and a little longer; after folding, the parts should be caught with a needle and thread, to prevent their displacement.

Fig. 243.



A front view of the splint as applied to the limb after the plaster is firmly adherent, the turns of the bandage covering the strips being omitted in the cut. (After Davis.)

These cushions should be changed every second day, particularly during warm weather, as they collect the secretions, and then are liable to excoriate the parts. For the first few days care should be taken that the splint is not kept on, after anything

like a sensation of heat or smarting is experienced in the groin. If proper care be observed at first, the parts beneath the perineal or extension band will have become so hardened as to render any excoriation improbable. Whenever the splint is removed, the extension by means of the weight should be applied, that the diseased surfaces of the joint may be constantly kept separated. The splint is intended to fit closely to the outside of the limb, and to be worn inside the stocking. That this may be done, and also that it might be worn unperceived, all additions to its thickness have been avoided, and irregularities upon its surface have been guarded against, as they would soon wear a hole through the clothing, and thus become obnoxious. Where the patient is an active, restless child, the splint may be secured yet more firmly by the application of a second spiral bandage, though this is not usually necessary."

The advantages of this plan of treatment are:

1. "It relieves all suffering after the limb is brought down in a line with the axis of the body, and the sensibility of the joint has had time to subside; but, from the commencement, there is a decided mitigation of pain. The time requisite to bring the limb down varies from one to twenty days, according to the tenderness of the joint and the contraction of the muscles. As a rule, whenever the patient complains of pain, we may be certain there is not the proper amount of extension upon the limb.

2. It retains the limb in the best position as to length, etc., whatever may be the result to the head of the bone.

3. It puts the diseased parts in the best position for their restoration with a perfect joint, as it relieves the pressure upon the head of the bone, while, at the same time, it admits of motion, which increases the recuperative energy of the parts, inasmuch as it increases their vitality.

4. In consequence of the favorable results mentioned, the patient's life will rarely, if ever, be sacrificed to the disease.

5. The relief afforded the parents and friends of the patient might be mentioned, as there are few diseases that make a greater demand upon the sympathies and physical efforts of friends than that of hip disease.

6. The relief from irritation afforded by separating the head

of the bone from the upper portion of the acetabulum must be seen in order to be appreciated. Patients with very depraved constitutions, where large abscesses had formed about the joint, in whom hectic fever would have been sure to follow their evacuation under the old mode of treatment, have, while extension was kept up, not had an unpleasant symptom, not even so much as any impairment of the appetite."

This has been confirmed in a remarkable degree by Dr. Smith's experience in several instances where he has fully tested Davis's mode of treatment.

It will not be expected that every case of morbus coxarius, although treated upon this plan from the commencement of the disease, will recover with a perfect joint; yet we can safely rely upon a far larger percentage than by any other mode. In addition, whatever may be the point at which the disease stops, the limb will be left in the best condition possible, considering the loss of structure sustained. If the head of the femur should be entirely destroyed, the limb should be kept at its full length; and if anchylosis takes place, it does so without material shortening of the limb. If a patient should recover from the disease while wearing the apparatus, great care is requisite that it be not laid aside too soon; the necessity of this caution becomes evident, when we consider upon how small a surface of the head of the bone, or of the cavity of the acetabulum, must rest the whole weight of the body, and frequently many times its weight, as in jumping, &c.

Again, this very small surface is the portion that has just recovered from disease, or, in other words, is a fresh cicatrix, the vitality of which is less than that of the original structure. There is yet another consideration: if inflammation takes place in this part, it will be of a far more active character than that with which it was at first affected, and will, very probably, speedily result in suppuration, if not subdued by proper treatment.

With the long experience of the profession in the success and result of hip disease under the treatment by rest and confinement to bed, it may appear that the results of Davis's method are exaggerated; but this is not so, as has been abundantly demonstrated by Dr. Smith and others who have employed this system of mechanical treatment. Davis's method may justly be regarded,

therefore, as a great boon to suffering humanity, and the best mechanical means now known of treating these intractable diseases.

With the experience of past years, it will probably be some time before general confidence will be given to a plan that permits motion in an inflamed articulation; yet, remarks Smith, "I have seen a child in the third stage of hip disease, with a large abscess around the hip, and the tissues suffering from marked inflammation, running about on a crutch with one of Davis's splints well adjusted to the limb." Under the use of this splint, the extreme flexion and abduction of the diseased thigh will soon disappear, or be greatly modified. Even in cases of extreme flexion of long standing, the gentle, long continued extension and counter-extension effected by this splint has greatly improved the limb, and diminished the deformity with its admirable *continuous extension*, as furnished by the elasticity of the perineal band of India rubber. During the whole of the treatment, the general health requires careful supervision. The diet should be regulated and made as nutritious as possible; the skin be kept in healthful action, with bathing and the use of the flesh-brush; the secretions maintained as near as possible in the standard of health, and the most perfect system of nutrition insisted upon. If any systemic derangements of the liver ensue, they must be treated according to the principles laid down in discussing those disorders. If diarrhœa set in, the remedies homœopathic to that condition must be employed. If obstinate constipation follow the use of the remedies employed, as frequently happens, it must be relieved by enemas of cold water or a dose of *Nux vom.*, *Alumina*, *Ammonium*, *Veratrum*, *Plumbum*, *Platina* or *Opium*, morning and evening. As the health improves a change of climate will often produce the most satisfactory results.

When abscesses form, they should be opened early, and the splints be retained as before. Judiciously selected remedies will continually be required to meet the various derangements that spring up during the course of treatment, as well as to overcome the constitutional dyscrasias that give rise to the malady. As well may the practitioner hope to cure consumption, or to ameliorate the condition of a person thus affected by the exclusive

employment of local applications and other external appliances, as to cure coxalgia or tuberculosis of the hip joint without the aid of well directed homœopathic constitutional remedies. It is in the treatment of this and like affections that the homœopathic system of medicine far excels its boasted rival in practical results; results that prove the potency and efficiency of this beneficent method of practice, as compared with that heroic medication, which if "the patient survives, his recovery will be effected at the expense of much suffering, too often eventuating in premature decay and dissolution."

Excision of the head of the femur, has of late years received considerable attention from the profession, particularly Messrs. Ferguson, Smith and Walton. Mr. Jones, of Jersey, and Mr. Hancock, to whom modern conservative surgery is so deeply indebted, have successfully removed not only the head of the femur but a large portion of the diseased acetabulum. The operation is not difficult of execution, the carious head of the femur lying at the bottom of an abscess or sinus may readily be exposed by a T incision, as represented in Fig. 238. After exposing it, the head may be turned out by crossing the limb over the opposite thigh and rotating inwards and pushing upwards, when it may be cut off through the neck or trochanter by means of a chain saw passed behind and cutting outwards. Care must be used that the incision be not carried too far forwards, for fear of wounding the anterior crural nerve; or too far backwards, lest injury be done the gluteal artery. After the operation, the wound should be dressed as in simple wounds, and a long splint applied, the proper extension being made from the opposite thigh. Shortening of the limb will be the inevitable result of the operation; but this having already taken place, it need not be considered as of great consequence, in comparison with the view of saving the patient's life whenever practicable. The success of the operation will depend upon the extent of the osseous disease. If the head of the femur is alone diseased, and lying dislocated on the dorsum of the ilium, it may be done with a fair prospect of success. But if the acetabulum be diseased at the bottom, implicating the pelvic bones, the head of the femur still being in the cotyloid cavity, and the pelvic bones per-

forated, perhaps the operation becomes a desperate one, and little good can result from its performance. The statistics of the operation, as far as known, give *thirty-eight* cases, of which *fourteen* died. It should not be performed, therefore, without the exercise of the most mature judgment, and then only as a dernier resort, all other means having failed and the patient willing to accept this as the only alternative left him.

PART XI.

AFFECTIONS OF THE MUSCLES, TENDONS AND BURSÆ.

CHAPTER I.

MUSCLES AND TENDONS.

SECTION I.

LACERATION OF MUSCLES.

The muscles most likely to suffer laceration, in consequence of violent muscular action, include the gastrocnemius, quadriceps, extensor-triceps, psoas, rectus abdominis, biceps and deltoid. The accident most commonly happens as a result of leaping, running, or efforts to lift heavy weights, long continued inactivity, and fatty degeneration, acting as predisposing causes.

The laceration rarely implicates the whole body of the muscle or its aponeurotic covering, being confined for the most part to a few fleshy fibres. The injury may occur, however, at any point in the line of the muscle, but is most frequent at the junction of the muscular tissue with the tendon.

Symptoms.—At the time of making some violent exertion, a distinct snapping noise will be heard, accompanied by intense pain at the seat of injury, the patient falling, if in the lower extremity, and remaining for a few moments unable to regain the erect posture. Manipulation will enable the surgeon to detect a gap between the severed ends of the fibres, while a distinct prominence will be observed in its immediate vicinity, occasioned by the retraction of the torn portion of the muscles. This will be

followed by more or less discoloration, tumefaction and tenderness upon pressure. The pain is generally very persistent and severe, during the reunion of the lacerated fibres, while all the symptoms indicating inflammatory action are greatly aggravated by efforts to exercise the parts. The mode of union in divided muscles is by means of a fibrous effusion taking place between the severed extremities. It occasionally happens that the muscular sheath is ruptured, so that the belly of the muscle forms a kind of hernial protrusion through the aperture.

Treatment.—The first and most important indication to be observed consists in properly approximating and keeping in position the divided ends of the muscle. To accomplish this, it will be necessary in *severe* cases to employ several deep stitches through the entire thickness of the muscle so as to keep up a thorough apposition of both the superficial and deep portions of the wound. In lacerations of the muscles of the extremities, great benefit will be derived from the use of two rollers applied in opposite directions which will not only tend to keep in apposition the lacerated extremities, but will also control the muscular contraction. The invaginated bandages for longitudinal and transverse wounds of the extremities, as shown on pages 114 and 115, vol. 1, will be found of great benefit in these cases. The *acupressure* pin in superficial laceration, as also the twisted or hare-lip suture may be found advantageous in certain cases. If the ruptured muscle be not deep-seated, beside the means already advised, great benefit will be derived by local applications of *Arnica*, *Hypericum*, *Cimicifuga*, *Hamamelis*, or *Phytolacca*. They should be employed in proportion of one part of the selected remedy, to nine parts of water, and kept constantly applied to the injured portion. Internally, *Hamamelis*, *Cimicifuga* or *Phytolacca* may be given according to indications.

The general principles of treatment recommended in the chapter on "Lacerated Wounds," vol. 1, page 638, is equally beneficial in the disease under consideration.

SECTION II.

RUPTURE OF TENDONS.

Tendons may suffer rupture either in consequence of violent muscular contraction or from external force. The tendo-achillis is most frequently the seat of this variety of accident. In the great majority of instances, the rupture occurs at the point of attachment with the muscle, the tendon being occasionally torn from its sheath, and left hanging by its other extremity.

The injury is generally indicated by a loud snap, the patient experiencing a sudden shock, with severe pain. The functions of the limb are completely suspended, and a distinctly marked interval can be felt at the point of injury. Tendons thus affected are liable to high inflammatory action, and a considerable time elapses before the functions of the limb are restored. Union is accomplished in a divided tendon by means of a nucleated blastema, effused beneath the sheath of the cut ends, which forms into a firm filamentous cord, uniting the severed portions of the tendon, and eventually becomes tendinous in structure.

Fig. 244.

Treatment.—Position and rest are the means mainly to be relied upon in the treatment of this accident. The limb is to be placed in a position to approximate the divided ends, which is accomplished by keeping the leg or arm flexed. In rupture of the tendo-achillis, a band should be placed above the knee or a cravat made to encircle the pelvis, a cord extending from either to a cravat passing around the instep, as represented in Fig. 104, page 188, vol. 1. In this

manner the leg is bent upon the thigh, the foot being extended. As more or less weakness of the tendon is generally experienced for a considerable time, a high-heeled shoe should be worn for several weeks after the patient begins to walk.

Rhus tox. and *Ruta grav.* are the most appropriate remedies in this affection, and the *Rhus* should in all cases be largely diluted, as many patients are extremely susceptible to its action, and unpleasant effects have been known to occur from using a too strong solution, and too frequently applied.

Ruta is also a remedy of great value in strains or ruptures of tendons, and should never be omitted in severe cases.

Aconite may be called for, as an internal remedy, provided there be febrile action.

Dislocations.—Tendons are sometimes dislocated or thrown out of the grooves in which they are naturally situated, in consequence of the laceration of the connecting ligaments, or retaining bands. The accident occurs most frequently to the tendon of the biceps where it runs along the bicepital groove of the humerus. It is attended with severe pain at the site of the injury, inability to move the affected limb, and more or less dislocation of the integuments. Replacement should be effected immediately, and the arm placed and retained in a flexed position, and *Rhus* or *Ruta* applied locally.

Hypertrophy of the tendons, of an irregular, knotty appearance, is often met with in rheumatic, gouty or syphilitic persons, and is readily detected by sight and touch. *Iodine* and *Mercurial* applications, with appropriate internal remedies, readily effect a cure.

CHAPTER II.

AFFECTIONS OF THE BURSÆ MUCOSÆ.

SECTION I.

INFLAMMATION OF THE BURSÆ.

The **Bursæ** consist of small sacs or pouches filled with a thin, unctious fluid, and are developed naturally in various regions of the body. Their favorite seat is the acromion process, angle of the thyroid cartilage, condyles of the humerus, olecranon, styloid processes of the ulna and radius, tuberosity of the ischium, great trochanter, condyles of femur, patella, tuberosity of the tibia, the malleoli, and the first and fifth metatarsal bones. They are also frequently met with in other situations, as a result of continued pressure or friction, but whether normally or abnormally developed, are liable to become affected by diseased action, the inflammation assuming either the acute or chronic form.

Acute Bursitis may arise in consequence of straining the parts, or from external violence, as a blow. The pain attending the inflammatory action exhibited in the bursæ is generally very severe, being tensive, throbbing and persistent; the parts become exceedingly tender, swollen, œdematous and highly congested; the skin becoming of a dark reddish color.

More or less constitutional disturbance arises, such as fever, headache, thirst, restlessness and loss of appetite. This condition often terminates in suppuration, the pus generally being thin, oleaginous and mixed with flakes of lymph, though occasionally it is found thick and intermixed with shreds of a sloughy character.

Treatment.—*Aconite*, *Arnica* and *Belladonna* will be found particularly applicable to the first stages of the affection; the heat, pain and swelling of the part being considerable and attended with corresponding febrile excitement.

Ledum should be employed in cases complicated with lameness of the neighboring joint. It is further indicated by the existence of fever and frequent chills.

Arnica, especially when the inflammation has been occasioned by a blow, the surrounding parts being very tender, and the pain of a dull, aching character.

Hypericum, when the pain is severe and extending to the surrounding tissues before suppuration sets in.

The above remedies may also be applied locally, diluting the *Tincture* with cold water. The œdema, which continues for some time subsequent to the disappearance of the more active symptoms, can be successfully combatted by occasionally dashing *cold water* upon the part, and applying an oiled silk *bandage*, to produce firm compression and to preserve heat and moisture in the part. *Hepar*, *Mercurius* or *Silicea* should be employed when suppuration threatens. Provided pus be formed, it is to be promptly evacuated by a free incision and subsequently treated as ordinary abscesses (page 261, vol. 1).

In subacute *Bursitis*, the part should be kept at rest and cooling medicated lotions applied as recommended in synovitis. Applications of the tincture of *Iodine* two or three times a day, or *mercurial* ointments rubbed over the part is productive of much benefit.

Chronic Bursitis.—"Chronic inflammation of the bursæ occasionally gives rise to remarkable structural changes, the most common of which is an indurated and hypertrophied condition, the result either of long-continued interstitial deposits, or the formation of adventitious membranes. However this may be, the walls of the affected sac are sometimes found to be upwards of a quarter of an inch in thickness, and of a dense fibro-cellular consistence, without the slightest trace of its primitive character. Under these circumstances, the cavity of the pouch is generally very small, filled with altered synovial fluid, and roughened upon its surface, so as to present an appearance not unlike that of a honeycomb. Now and then shreds of lymph are stretched across its interior, dividing it into different compartments. In cases of very long standing, partial ossification of the cyst has been noticed."

The inflammatory action is generally due to a straining of the parts or to pressure, and is frequently so mild as only to result in an increased secretion; the fluid contained in the sac being little changed from ordinary synovia. In other instances the fluid becomes changed to a thick, gelatinous consistence, sometimes even resulting in the formation of a solid tumor.

Rice-shaped concretions, of a fibrous or cartilaginous nature, are also occasionally found intermixed with the contents of the cyst.

Varieties.—Different names are given to these increased effusions in the bursæ, according to the localities in which they are found: thus, those in the bursæ of the tendons on the front and back of the wrist joint, are called *Ganglia*, while those in the vicinity of the knee joint are designated as *Housemaid's knee*.

Symptoms.—The symptoms of enlarged bursæ are easily recognizable. Thus, there is a tumor formed by the accumulation of either synovia or fibrin, or both, mixed within the sac, this tumor being more or less globular in its shape, and generally presenting more or less fluctuation in it. Sometimes, however, the contents of the sac so distend it that fluctuation can hardly be perceived, and then it is so hard as readily to be mistaken for a fibrous or other solid tumor. The treatment of this affection will be considered under the designations of *Ganglia* and *Housemaid's knee*.

§ 1.—GANGLION.

A Ganglion is an encysted tumor situated in the course of a tendon, and varying in size from the volume of a pea to that of a large marble. The contents of the cyst consist of a clear, transparent fluid, yellowish in color, sometimes thin and serous, at others thick and jelly-like in consistence. In form it is globular and distinctly circumscribed, being smooth, elastic and tense. Its favorite seat is the back of the wrist, though it is also found in other situations, as in the palmer surface of the wrist and the dorsum and sole of the foot.

Ganglia, as usually developed, are movable, free from pain, unless inflamed, and unaccompanied by any change in the normal appearance of the skin. As the fluid accumulates, a sensation of stiffness and soreness is produced in the adjacent parts, the joint becoming weak and sometimes entirely useless.

Their origin can commonly be traced to long continued and excessive play of the tendon implicated, to a strain occasioned by over-exertion, or to mechanical injury.

Treatment.—In ordinary cases a cure can be readily effected by suddenly rupturing the sac, as by quick and violent pressure, or by a blow with a book or rule. The fluid thus escapes into the surrounding areolar tissue and is gradually absorbed. A more neat and quite as effective procedure is often resorted to, by subcutaneously passing a fine pointed bistoury through the sac, and squeezing out its contents, after which moderate pressure may be employed for a time to insure adhesion of its walls. Excision and direct incision should be avoided, except in cases where the tumor is of large size and filled with a semi-solid matter, as the inflammation likely to ensue may endanger the function of the neighboring joint.

Arnica has been used with good results by Hill & Hunt, who state that they have removed ganglia of years standing, resulting from violence, in which the tendons were so involved as almost entirely to distroy the use of the hand. It should be administered internally, applying the tincture externally, at the same time using firm compression.

Ruta is especially servicable in treating ganglia occurring on the wrist or about the tarsal joints.

Rhus tox. is often of great service after the employment of *Arnica* for a few weeks, or it may be advantageously alternated with it.

Baryta carb. is also useful in bursal enlargements of the chronic variety, especially in scrofulous constitutions.

Calcarea carb. has been successfully employed by Dr. E. A. Murphy, of New Orleans, in an exceedingly obstinate case of nine years standing, with the most complete success.

Jodium is one of our best internal remedies in scrofulous swellings and indurations of whatever nature, and I have employed it successfully in ganglia, after *Belladonna*, *Aconite*, and *Conium*, had proved insufficient. "It is a fact," says Hempel, "and substantiated by abundant experience, that iodine is one of our sovereign remedies for all affections emanating from disordered conditions of the lymphatic system, and even as Trosseau and

Pidoux justly observe, for the scrofulous diathesis itself." In the case of *lymphatic swellings*, after the subsidence of the active symptoms, a resolution is more certainly effected by iodine than perhaps by any known remedy. It may be used externally, also, by painting the part once or twice a day with the ordinary tincture, as heretofore recommended.

Graphites, in chronic enlargements, attended by redness and tumefaction of the surrounding parts, with sensations of burning and itching.

Phosphoric acid., *Hepar*, *Mercurius*, *Rhus* and *Silicea*, will be found useful in suppuration of the tumor.

§ 2.—HOUSEMAID'S KNEE.

Housemaid's Knee is a term employed to designate an enlargement of the bursæ over the patella. It is commonly met with in servant girls accustomed to resting their knees upon the floor in the act of scrubbing, and hence its name.

The presence of the affection is primarily indicated by a slight enlargement and thickening of the textures on the front of the knee; there is also an effusion of fluid into the bursal sac, creating a slightly flattened or rounded tumor immediately below the joint. It is rarely painful, occasioning little inconvenience except from the mechanical obstruction it produces by interfering with the motions of the leg. Occasionally, however, it becomes highly inflamed, the diseased action extending to the joint. Miners are occasionally subject to an enlargement of the bursæ lying over the olecranon, hence termed "Miner's elbow," and in any situation these bursæ may be formed by continuous pressure and friction conjoined. The appearance of the parts is well shown in the accompanying figure, 245.

Fig. 245.

The contents of enlarged bursæ are varied in character; sometimes presenting a serous fluid of an amber

color; at other times, dark or brownish, intermixed with cholesterine, and containing whitish bodies, of a fibro-cartilaginous appearance resembling grains of rice. The wall of the enlarged bursæ is often thin; at other times greatly thickened by the deposit of concentric layers of plastic material within it, until the cavity is completely obliterated, and a dense fibrous tumor formed in its place.

Enlarged bursæ are readily recognized; forming, whilst their contents are thin and serous, indolent oval tumors with distinct fluctuation. As they become solid, they acquire an elastic and hardened feel, crackling under pressure, especially in those cases which contain the rice-shaped bodies; as the deposition increases, they finally attain all the character of an ordinary solid growth. When they become inflamed, the skin covering them is red, often doughy and œdematous, the tumor is hot and tense, and the inflammation by continuity of tissue extends into the neighboring joint. Suppuration very frequently occurs; the tension increases, the redness and œdema become more marked, and the pain assumes a throbbing character.

Treatment.—The treatment of this affection depends entirely upon its nature and actual condition when inflamed,—rest, *Aconite* internally and locally, in the form of a lotion, and applied continuously, will ordinarily subdue the inflammatory stage. After the more active symptoms have subsided by means of this treatment, *Belladonna*, *Rhus* or *Ruta* may be substituted for the former remedy, and continued until all evidences of disease have passed away. *Hepar sulph.*, *Iodine*, *Calcarea carb.*, *Kali carb.*, *Bryonia*, *Mercurius jod.*, *Arsenicum* and *Silicea*, afford excellent remedies for the subacute or chronic stage of the disease. If suppuration threaten, *Hepar* and *Silicea* become potent to cure. If, in spite of the remedies, suppuration takes place and the tumor be of considerable size, it must be opened by means of a small trocar and canula, or a tenotomy knife, and the contents of the sac evacuated. When these tumors assume an indolent condition, the surgeon may select different modes of treatment in accordance with the character of the disease. If the sac be *thin*, the disease recent, it may be readily removed by the external application of *Iodine*, and the internal remedies men-

tioned above. The plan recommended by Velpeau, of injecting tincture of *Iodine* into the sac, or by passing a small needle through it, has, in the hands of the author, proved most successful. A stout thread of hemp or silk passed through the centre of the tumor will convert the diseased mass into an abscess, which may be freely opened and its contents discharged and dressed with pledgets saturated in *Staphysagria* lotion. The cure in this case will rarely occupy more than a week or ten days. In some cases a cure has been effected by puncturing the cyst, and then employing pressure upon it. The *Iodine* injection excites inflammation, which overcoming the diseased process, produces an agglutination of the walls of the sac. If the seton is preferred, it may be employed in the following manner: First, tap the sac with a small trocar and canula, then pass the seton through the trocar into the sac and out again. The threads may be permitted to remain for six or eight days; inflammation is aroused as in the case of the injection and a cure is effected. If the walls of the cyst are very *thick*, or its contents semi-solid, or the tumor thickened and solid, it may be dissected out, as has been done in those solid bursal tumors situated over the patella, or the tuberosities of the ischium. Care should be taken in dissecting out these solid bursæ, that the incisions be not made too wide of the disease; and more especially, to avoid separating the attachments of the fascia of the limb from the edge of the patella, otherwise the layer of cellular tissue leading into the popliteal space will be opened up, and deep infiltration and dangerous abscess of the limb may result. In case of suppuration of enlarged bursæ, especially those situated over the patella, a free incision should be made through their wall, and the pus and contents be let out.

CHAPTER III.

WHITLOW.

Whitlow, commonly called **Felon**, and technically **Paronychia**, is a term applied to a severe form of inflammation, attacking the fingers and toes, and having a tendency rapidly to term-

inate in suppuration and sloughing. In the milder exhibition of the disease, the inflammatory action is confined to the pulp of the finger, implicating the skin and fibro-cellular tissue, while in the more severe cases, the tendons, periosteum and bone are frequently destroyed.

The affection is especially characterized by excruciating pain, rapid occurrence of suppuration, peculiar dusky appearance of the skin, together with its situation, boils and carbuncles never affecting the extremities of the fingers and toes.

Etiology.—Erichsen gives the following reasons for regarding it an erysipelatous affection:

1st. Because the causes, whether of season, infection or local irritation, appear to be the same in both affections. 2nd. The constitutional disturbance is always very severe for so slight a disease, and assumes the same character of speedy depression that we observe in erysipelas. 3rd. The inflammation of the affected finger is invariably diffuse, never being bounded by adhesion, but always tending to terminate in suppuration and sloughing. 4th. So soon as the disease spreads beyond the affected finger, or to the back of the hand, it assumes a distinctly erysipelatous appearance and character.

However this may be, it is evidently a low type of inflammation, and observation has fully established the fact that it rarely, if ever, occurs in persons of a sound constitution. The exciting causes are frequently very obscure. In some instances, it can be traced to a blow, puncture, or sudden change of temperature, while, in other cases, no apparent cause exists. The disease, sometimes, occurs as an epidemic.

Symptoms.—In the more mild and superficial forms of whitlow, the first indication of the existence of the disease is a burning pain, with slight swelling and dusky redness around the matrix of the nail. In the course of a few hours, however, the parts become tensive, throbbing and exquisitely painful, the constitutional symptoms being more or less marked. Two or three days subsequent to the manifestation of these phenomena, pus forms around and beneath the nail, the posterior extremity of which becomes elevated and the whole nail eventually loosened. The entire finger is now considerably inflamed, while the greater part

of the hand is swollen, hot and painful. The lymphatics of the arm usually participate, to a greater or less extent, in the inflammation, as evinced by the presence of a reddish line extending up the limb, frequently as far as the axilla. In this variety the skin and cellular tissue are the textures principally implicated.

In the more severe cases, in which the deeper structures, as the tendons, periosteum and bone become invaded, the pain is of the most intense character, depriving the patient of rest and sleep for several successive days and nights. The pain, however, is not confined exclusively to the finger, but extends to the elbow, and even along the entire length of the arm. The swelling often becomes enormous, the finger and hand presenting a puffy, erysipelatous appearance, while the skin is tense, dark red and œdematous. Pus is rapidly generated in the cellular tissue, sheaths of the tendons, and beneath the periosteum, while the bone itself becomes necrosed, destroying, perhaps, the whole phalanx, and in some instances the entire finger. From the ulcer thus formed, fungous granulations subsequently appear, giving the affection a character resembling certain forms of malignant disease.

The constitutional symptoms are correspondingly severe, the pulse being strong and frequent, face flushed, extreme thirst, loss of appetite, tensive or lancinating pain in the head, back and limbs, while in some cases there is more or less delirium.

Prognosis.—In the first variety, especially if early subjected to appropriate treatment, a favorable prognosis can usually be given. In the second variety, however, the surgeon should be particularly guarded respecting his promises to effect a perfect cure, provided the pus has been permitted to burrow in different directions, without being evacuated, until after necrosis has occurred.

Treatment.—The remedies that have been of most service in the treatment of this affection are *Alumina*, *Anthracin*, *Apis mel.*, *Arsenicum*, *Hepar sulph.*, *Mercurius*, *Phytolacca*, *Nitricum acidum*, *Silicea*, *Graphites*, *Rhus tox.*, *Sulphur*, *Carbo veg.*; *Calendula*.

Alumina is valuable in the first stage of the affection, when there is present a sensation of burning and stinging, with slight

edness and swelling on the extremity of the finger. It may be sed both internally and locally, by moistening the powder with oney or simple syrup, and applying it to the affected surface, enewing from time to time, as circumstances require.

Anthracin, when the burning is intense, with suppuration, nd when *Arsenicum* has yielded no relief.

Hepar sulph. is also beneficial in the early stage, when the isease is superficial, pain severe, and the abscess forming under he nail, the pain shooting up to the external condyle. It allays he swelling, removes the numbness and stiffness from the fingers, lieves pain, and hastens the formation of pus. After the pus evacuated, *Hepar* and *Silicea*, given alone, or in alternation, ill effect a cure. When the abscess is slow to point, these rem-dies will expedite the process.

Arsenicum is of service in the later stages, when the part ssumes a bluish red appearance, with intense, burning pain, iffness and rigidity of the joints, the parts assuming the char-cteristics of gangrenous inflammation, the pus being sanious nd ichorous.

Mercurius, when the pains become intolerable at night, with ntense aching and burning under the finger nail, accompanied ith hardness of the surrounding tissues, with slow and tardy uppuration.

Phytolacca is recommended when the disease is located in the alm of the hand, the pains being sharp, darting and passing hrough to the back of the hand, and extending up the arm.

Silicea is one of the most valuable remedies in this affection, hen the bones are implicated, parts swollen, intensely red, and nshapely, exceedingly sensitive to the touch, pains severe, and xtending over the whole forearm, and sometimes to the axilla, he whole site of the nail being covered with fleshy excrescences.

Sulphur is indicated when there is coldness of the fingers, oints red and stiff, the finger appearing dead and shriveled, with arting, tearing pains, especially when the patient possesses a soric diathesis. If the pain and swelling continue, and sup-uration threatens, *Hepar* and *Silicea* may be advantageously iven.

Carbo veg., if the parts look black and angry, with burning, tearing and throbbing pain, with tendency to suppuration. *Sepia*, for contraction of the finger with violent, stinging and beating pain; *Ledum*, if the disease arise from a puncture; *Calendula* always as a lotion when suppuration has taken place; *Symphytum*, when the bone is involved in the morbid process.

Nitric Acid, abortive treatment.—An interesting monograph, written by Dr. J. Hirsch, of Prague, on the speedy cure of Whitlows by Nitric Acid,* says: that "*Nitric acid* is to be considered as purely specific in the cure of whitlow," and instances several cases cured by this remedy. The manner of using it is to apply the concentrated acid to the inflamed part by means of a thin slip of wood, as thick as a moderately strong knitting-needle, or a common match may be used after removing its head, or a camel's hair pencil; dip it into the glass bottle containing the acid, then smear the inflamed reddened spot slowly and lightly in its whole circuit. This can only be done by frequent applications of the acid, and should it happen that the patient, during the application, complains of a biting itching or burning, or the limits of the inflammation marked by the redness have been transgressed, a momentary plunge of the finger into cold water will instantly remove the suffering. When the inflamed parts have been properly and frequently smeared, a bright yellow color usually shows itself on the portion of skin treated with the acid. The finger is then to be bound up very gently with a linen rag. If the skin is tender, one or two applications will suffice to regulate the disorder; if the skin is hard and tough, repeated applications will have to be made. If the whitlow be caused by a splinter of wood or other substance driven under the nail, the foreign body must first be removed in all cases.

If the disease be severe, or of *the higher degree*, and pus has already formed and collected in considerable quantities, the first thing to be done is to open the abscesses already formed. This may be effected *without pain* by the use of *local anæsthesia* and Dr. Bigelow's "spray producer," as recommended on page 147, vol. 1. The vitality of the tissues being temporarily destroyed

* British Journal of Homœopathy, vol. 21, page 218.

before making the incision. After the pus has been entirely discharged, the finger should be bathed for ten or fifteen minutes in a vessel filled with about 12 ounces of tepid water, to which has been added 10 or 15 drops of a saturated solution of caustic potash, repeating the bath the two first days three times within the 24 hours, as the pus diminishes; the bath after this period, may be proportionately diminished in frequency. After each bath the finger is carefully dried and bound with a linen bandage thinly smeared with any common animal grease. *Silicea*, *Calcarea* and *Sulphur*, hold the first rank as specific remedies; the practitioner selecting the one particularly indicated for the individual case.

Where the discharge of pus is profuse I have derived much benefit from sprinkling the part with *Hepar sulph.* 2nd, two or three times a day.

Rhigolene.—The atomizing of this hydro-carbon, through Dr. Bigelow's apparatus, as described on page 148, vol. 1, upon the inflamed part, at the beginning of the disease, has produced in my hands the most beneficial results; the intensity of cold temporarily constringing the blood vessels and impeding circulation to an extent sufficient to check the disorder in its incipiency. If the disease is seen at the beginning and before the inflammation has become too extensive, three or four applications of ten minutes interval, and each application being continued twelve or fifteen seconds, or until the skin turns white under the action of the remedy, has, in my hands, often broken up the disease; the parts soon being restored to their normal functions.

Surgical interference.—If the disease is seen too late to use the abortive treatment successfully, or if in spite of treatment it has run into the second stage, the early evacuation of pus and free division of the tissues is required so as to prevent the inflammation from spreading and involving neighboring tissues. By "early evacuation," I mean its evacuation by incision within forty-eight hours after the first positive evidence of the existence of the disease. The incision should be made by a scalpel, dividing freely the theca and tendon *to the bone*, and extending the whole length of the phalanx affected. If more than one phalanx

is diseased, another incision will have to be made; the incisions corresponding in number to the phalanges involved in the morbid process. In making the incision caution must be used that it does not cross the joint, dividing the capsular ligament in its course; if so, inflammation of the joint will set up with a probable loss of the articulation and permanent stiffness of the finger. The incision should be made lengthwise and along the centre of the finger, so as not to divide the artery and nerve that runs along its side. If the patient is timid and dreads the pain that proceeds from the use of the knife, the vitality of the part may be temporarily blunted by the use of the rhigolene spray, as previously explained, or anæsthetics may be administered as recommended on page 141, vol. 1. The relief experienced after the operation, is generally great and speedy, and often a full night's repose is enjoyed after the operation, the first, it may be, since the commencement of the disease. After evacuating the pus I have been in the habit of applying warm poultices of slippery elm bark moistened in a lotion of *Calendula* water until the parts have been thoroughly cleansed; afterwards bathing the sore, morning and evening, with castile soap and water, and dressing with *Calendula* lotion in the interim, as recommended in ordinary abscess. The internal treatment will be continued as before advised, selecting from among the remedies given, the one most indicated. Caries of the phalanges is frequently the result of badly treated paronychia, and cases sometimes occur in which the practitioner is not consulted until portions of the fibrous and tendinous structures, and the bones themselves become necrosed from long continued inflammation. In such cases the surgeon should remove the dead tendons and separated portions of bone, rather than amputate the diseased finger. Even when the whole of the distal extremity of the finger is dead, resection may be performed successfully, and the end of the finger when saved, even though not perfect in its formation, will be of great service to the patient in after life. It has been proven that the periosteum in such cases will reproduce the bone that is lost if the after treatment be properly conducted. I have had most success in such cases by the use of *Ruta* and *Hypericum* lotions applied locally; the remedy being

also taken internally. By this means I have succeeded in a number of cases in restoring both joint and phalanx that seemed at first blush to be hopelessly lost.

CHAPTER IV.

TOE NAIL ULCER.

This distressing disease of the foot assumes the form of the irritable ulcer, and is found on the inner and sometimes also on the outer side of the flesh adjoining the nail of the great toe. This ulcer is the result of inflammatory action developed in the part by an accidental bruise, the wearing of a tight boot, etc. In consequence of the inflammation, the skin swells and rises over the side or end of the nail, which gives it the appearance of being buried in, or growing into the flesh. This, however, seldom takes place, it being extremely rare that its origin is attributed to the incurving of the nail, as compared with the puffing of the skin in consequence of inflammatory action.

As the inflammation increases the soft tissues distend, the cuticle breaks, and an ulcer is formed of the irritable variety, the suffering being considerable and kept up by the continued irritation of the edge of the nail. Sometimes the whole toe inflames, followed by suppuration and ulceration at different points about the nail, from which shoot forth fungous growths that are exceedingly painful and tender while walking; at other times the inflammation travels around the root of the nail and involves its matrix, producing a species of *onychia*. When the inflammation extends to the bone, caries takes place, followed by destruction of the phalanx, as has been pointed out in paronychia of the fingers.

Prognosis.—In forming a prognosis of this affection, we should be cautious in expressing the opinion that it will get well without the removal of the nail, although sometimes such may be the result under careful and judicious treatment.

Treatment.—This affection being altogether a local one, occurring in most cases, it is true, in an unhealthy constitution, the proper plan of treatment will be to use both local and general means in establishing the cure.

Palliative Treatment.—If the toe is in an *inflamed* and *irritable* condition and it is found unnecessary to remove the nail, the foot should first be elevated and covered with a warm poultice of slippery elm bark saturated in *Hypericum* or *Calendula* water, or cloths dipped in the lotion for two or three days, so as to relax the tissues and relieve the inflammation, and give internally *Phosphoric acid* or *Silicea*, until the soreness and irritation has considerably abated. This will be accomplished generally in two or three days. Then scrape the top of the nail tolerably thin and place a light packing of lint or charpie under the edge of the nail to lift it above the sore; or, place a very small compress over the part swollen and fasten it down by a small strip of adhesive plaster carried around the toe and over its side, so as to force the flesh off the nail, as recommended by Dr. Meigs, of Philadelphia.* An excellent plan is to cut a small narrow strip of tin, turn over its edge so as to hook it under the nail, and then carry the piece over the nail and the edge of the toe, and fasten by a narrow strip of adhesive plaster. I have frequently succeeded in this way of getting rid of this troublesome affection when all other means failed. As the nail grows in length it should be trimmed *only at the end*, leaving the sides intact to push back the fleshy tissue, whose tendency is to grow over the edges and continually to reproduce the very evil you are seeking to cure.

Radical treatment is best effected by the removal of the offending nail, an operation which, before the introduction of anæsthesia, was looked upon as exceedingly painful, but which can now be performed without the patient being conscious of its

---

* Dr. Hornby, of Poughkeepsie, New York, thus writes: "Several very aggravated cases of whitlow have been treated by me with *Mercury*, *Hepar* and *Sulphur*, all of middle decimal dilutions and with success. I have also frequently applied with benefit a poultice of bread crumbs, saturated with a solution of Bicarb of Potash dissolved in water, in the proportion of a drachm to the ounce."

removal. This may be accomplished by creating perfect anæsthesia, in the manner heretofore described while treating on that subject, and by the use of a pair of sharp-pointed scissors, one blade of which is thrust under the nail throughout its whole length, and divide it in the centre; then seize each half of the nail at its base, and twist them out in turn, taking the precaution to remove that part first which has been the cause of the trouble; after the slight hemorrhage has been checked by applications of cold water, cauterize the entire matrix from which the nail grows, then cover the part with a pledget of lint saturated in *Hypericum* or *Calendula* water, and apply temporary dressings to preserve the lint in situ, and treat the sore as a simple ulcer. It will heal in ten or twelve days, and the patient be radically cured. If the evulsion be not thoroughly done and the matrix carefully cicatrized, a new nail will be liable to reproduce the disorder.

If the patient is averse to having perfect anæsthesia produced, local anæsthesia may be employed by the use of rhigolene, as advised under that head, and the operation be proceeded with as recommended. I have frequently used this latter method with the most satisfactory results. It is highly important to carry this process to a complete benumbing of the part before the removal of the nail is attempted.

Dr. Gilman† proposes a simple and immediate cure for this affection by heating a piece of tallow in a spoon over the flame of a spirit lamp, and then pouring a few drops over the granulations. It was tried in the case of a young lady who was unable to wear a shoe for months with almost magical effect. Pain and tenderness were relieved at once, the granulations in a few days disappeared, the diseased parts became dry and destitute of feeling, and the edge of the nail became so exposed as to admit of its being pared away without inconvenience. The cure was complete, and the disease never returned.

Nitric acid.—The process of treating this disease by nitric acid, as advised under the head of Whitlow, appears to me to possess advantages equal to any of the methods hitherto described,

† Boston Medical and Surgical Journal, December, 1859.

and I can see no good reason why it may not be satisfactorily adopted in the cure of this disorder, especially in those cases where the nail does not protrude into and irritate the flesh.

Perchloride of iron has been recommended by M. Wahn, and its application consists in stuffing the powdered perchloride between the edge of the nail and the ulcer. The sensibility is first considerably augmented by the process, but in a few minutes all pain is removed and the diseased part becomes as hard as wood.

Inverted toe nail.—This affection is caused by the ingrowing of the nail into the soft structures of the toe, and is generally brought about by cutting the nails too close at the sides and round the corners, which causes that part of the nail to grow faster and penetrate the flesh. Its treatment will be the same as previously recommended in the preceding article. It has been recommended to pare away the soft structures corresponding with the projecting nail, and thus permit the nail to grow without resistance, and consequent relief of all preceding symptoms.

Bunion.—This is a swelling implicating the first joint of the great or little toe, produced by pressure or other cause, effecting a change in the position of the joint. The integuments over the joint become enlarged and thickened; the great toe, if that is the articulation affected, becomes distorted in position, pointing obliquely across the other toes, leaving the shoe to press upon the joint. This angle being constantly pressed upon by the boot, becomes irritated, and, for its protection, the bursa of the joint becomes enlarged, or an adventitious one forms. From time to time the bursa and projecting point become irritated and inflamed, and the morbid action, thus set up, increases until it becomes a disease of more or less magnitude. In advanced life, the synovial membranes of the joint become distorted and secrete less fluid than in a healthy state; in a short time they become stiff, painful, and partially anchylosed; the skin thickens over the surface, and is studded with

Fig. 246.

clusters of small superficial corns; the bursa becomes enlarged; the effused fluid produces swelling over the joint; pain increases; suppuration ensues, and caries of the bones or exfoliation of the joint may take place.

Treatment.—The first thing to be attended to in the beginning of this affection, is to change the direction of the toe, by wearing properly-made boots. To remedy the faulty position of the toe it has been recommended to divide the external lateral ligament of the metacarpo-phalangeal articulation, or the tendon of the adductor pollicis, or the inner head of the flexor brevis pollicis, the toe, when restored to its position, being for a time kept fixed upon an under splint. Pressure upon the bunion may be prevented, by wearing over it a circular piece of amadon spread with soap plaster, and perforated in the centre with an aperture corresponding with the size of the tumor. If accidental inflammation be excited in the part, it may be allayed by the use of *Rhus*, *Ruta* or *Hypericum* lotions applied by means of a compress laid over the part and retained by a roller. If the bursa is thickened, tender and inflamed, after the subsidence of the inflammation, it may be painted with *Iodine* or a weak solution of *Nitric acid*.

Dr. Hornby, of Poughkeepsie, New York, reports having cured a severe case of bunion of the great toe with *Sepia* 30th.

Arnica is appropriate when the swelling and pain result from a blow or constant friction of the part.

Hypericum, when the pain is exceedingly severe and of a grinding character, as if the parts were being torn asunder.

Graphites, in chronic enlargement of the bursæ, with redness of the surrounding parts, and attended with itching. *Agaricus* is also recommended for this latter symptom.

Ruta is valuable when the pain is dull, heavy and continuous, as if it were being squeezed or pressed upon by a heavy weight.

Hepar, *Mercury* and *Silicea*, when there is a tendency to suppuration; *Bryonia*, when the pain is shooting and aggravated by motion. *Lycopodium* may also prove serviceable under these circumstances.

PART XII.

INJURIES OF REGIONS.

CHAPTER I.

INJURIES OF THE HEAD.

The importance attached to injuries of the head is not due so much to the special considerations connected with the mere injury of the scalp and cranium, but rather to the effects that are produced as the result of the implication of the brain and its membranes, in many cases directly, and in others indirectly, owing to the close connection that exists between the actions that occur between the external and internal structures of the head. In consequence of this tendency to cerebral complication, it is of the first moment in practice to study these injuries as a whole, and with special regard to those affections of the brain produced by them; and from which the injury of the scalp and fracture of the cranium derive the greater part of their importance. It is therefore necessary, in the first instance, to be acquainted with the nature and treatment of the principal forms of cerebral affection that supervene upon these accidents, before we proceed to study the special nature and peculiar modifications of treatment required by the conditions that occasion them.

§1.—CEREBRAL DISTURBANCE.

There are two principal states of functional disturbance arising from the injuries to which the brain is subject, viz: *concussion* and *compression*; either of these may be followed by, or be complicated with, inflammatory actions of various kinds, that

derive much of their peculiar characteristics from the condition with which they are associated, and from the injury by which they are occasioned.

Concussion, or stunning, appears to be a shock communicated to the nervous system from the application of such external violence as will produce commotion of the substance of the brain, or interfere with the circulation through it; in consequence of which its functions become temporarily suspended, usually in a slight and transitory degree, but occasionally to such an extent that the patient does not rally for many hours from the depressed state into which he is thrown, and, perhaps, sinks without recovery. In those cases, in which death immediately results from the continuance and severity of the concussion, either no lesion at all may be found in the cerebral substance, or it may have been rendered so soft, or semi-diffluent, by the shock to which it has been subjected, as to be evidently incompatible with life, even though no distinct rupture of its substance seems to have occurred. In other cases, again, more serious injury, such as its rupture, may have taken place.

Symptoms.—In the slighter cases of concussion—that degree, indeed, which invariably accompanies any severe injury of the head—the surface becomes pale and cold; the sufferer is motionless and insensible, or only answers when spoken to in a loud voice, relapsing again into speedy insensibility, or, rather, semi-consciousness; the pulse is feeble, the pupils contracted, and the sphincters usually relaxed; the limbs are flaccid, and muscular power is lost. After continuing in this condition, which is the first stage of concussion, for a few minutes, or hours, according to the severity of the shock, the second stage comes on, the circulation gradually re-establishing itself, the pulse becoming fuller, and the surface warmer. About this time the patient very commonly vomits; the straining, accompanying this effort, appears to be of service in stimulating the heart's action, and driving the blood with more vigor to the paralyzed brain, thus tending to restore its functions; and we accordingly find that, after vomiting has occurred, the patient quickly rallies. In the more severe cases, the symptoms that have just been named are so strongly marked the patient appears to be moribund; there is complete prostration of all ner-

vous and physical power; the surface being cold and death-like, the eyes glassy, the pupils either contracted or widely dilated, the pulse scarcely perceptible and intermittent. The patient may be in this state for hours, recovery being slow, and the concussion merging into some other, and, perhaps, more serious affection of the nervous centers, or, indeed, in some cases, speedily terminating in death, apparently by failure of the heart's action.

The *terminations* of concussion are various. We have already seen that in some cases this affection may speedily give way to recovery, although slight headache, some degree of giddiness, confusion of thought, and inaptitude for mental occupation, may last for a few days before the mental powers are completely re-established. In other cases again, the concussion may rapidly terminate in the patient's death, but between these conditions there are several intermediate states. Thus the recovery may be complete, but a permanently irritable state of the brain may be left, the patient though capable of the ordinary duties of life, becoming readily excited by slight excesses in diet or in the use of stimulants, or by mental emotion, though not of an inordinate intensity. Those individuals suffering from a preternaturally irritable brain, frequently die suddenly in the course of a few months, or a year or two, after the receipt of the injury.

In other cases the recovery continues to be incomplete, although the patient may be able to follow his ordinary occupation; but yet his state is a precarious one, the brain being particularly liable to the occurrence of inflammatory disease. In such cases, there is frequently a certain degree of impairment of mental power, the memory either failing generally or in certain important points, as with reference to dates, places, persons, or language. The speech is perhaps indistinct and stuttering. Amaurosis of one or both eyes, with perhaps squinting or paralysis of the eyelid. The hearing may be impaired, or noises of various kinds set up in the ears. There may be diminution or loss of muscular or virile power, especially in those cases in which the injury has been inflicted on the back of the head. For these symptoms to occur, it is by no means necessary that the local injury be severe. In some cases, in railroad accidents more especially, or in falls from a hight, the whole nervous system seems to be jarred and con-

cussed without any apparent internal injury of the head. At first the symptoms are but slight and the patient congratulates himself on his escape, but gradually impairment of nervous power, manifesting itself in one or the other of the ways just mentioned, comes on, and the health continues broken through life.

In other cases again, the symptoms of concussion may gradually terminate in those of compression, and not infrequently the reaction that comes on, passing beyond the bounds that are necessary for the re-establishment of the healthy functions of the brain, terminates in an inflammatory condition of this organ.

Compression of the brain is a common condition in injuries of the head, arising as it does from a great variety of causes—from pressure of a portion of bone, of blood extravasated, or pus formed within the cranium, or from a foreign body lodged there.

Symptoms.—The patient lies in a state of coma, stupor or lethargy, being paralyzed more or less completely; heavy, insensible, and drowsy, not answering when spoken to, or only when addressed in a loud voice and shaken perhaps at the same time. The breathing is carried on slowly and deeply, with a stertorous or snoring noise, and usually with a peculiar blowing with the lips; one or both pupils are dilated; the pulse is full, often slow; the fæces passing involuntarily, and the urine not uncommonly being retained; the skin may be cool, but in many cases, on the contrary, is rather hot and perhaps perspiring; not infrequently this state of stupor alternates with paroxysms of delirium, or of local convulsive action.

This state of coma may become complicated by the occurrence of symptoms of inflammation; and unless the cause that produced the compression be removed, it usually terminates speedily in death, the patient sinking gradually into more complete unconsciousness, and the symptoms suddenly disappear.

Diagnosis.—Though the diagnosis between compression and concussion may have been sufficiently well indicated in the preceding description of each, it still may not be amiss to compare briefly these two conditions. *Compression* of the brain, due to whatever cause, is to be distinguished from *concussion* by the fact that in the latter the respiration is feeble, whereas in com-

pression it is stertorous. In concussion there is a quick, feeble pulse, 90 to 130; in compression it is slow, heavy and full. In concussion the patient may be partially roused for a moment by loud speaking or shaking, but in compression he generally remains wholly unconscious. In concussion the skin is cool and moist; in compression it is hot and perspiring. In concussion the pupils are contracted; in compression they are dilated.

It is sometimes desirable to distinguish *drunkenness* from either concussion or compression, which can often be done by instituting a careful examination, aided by the odor of strong drink proceeding from the patient's breath. Either of the two latter conditions, however, may exist in conjunction with drunkenness, in which case the fact is to be ascertained by waiting sufficiently long for the effects of the liquor to pass off; after which time, if the patient does not rally, it may be safely concluded that some other difficulty is present.

Irritation of the Brain is a condition, although differing completely from concussion or compression, not infrequently complicates these states, or may supervene independently of either, upon severe injury of the head. It appears to be connected with laceration of the cerebral substance.

Symptoms.—The patient lies in a state of semi-consciousness, unobservant of what is going on around him, unless spoken to or otherwise aroused. He does not, however, lie quietly, but moans, tosses himself about, and not infrequently curls and twists himself forward, with his back bent, and his knees drawn up towards the chest. When spoken to, he answers in a peevish, irritable manner, if at all, frequently frowning and distorting his countenance, and being evidently pained at any effort to fix his attention. He is occasionally convulsed, and, at other times, seized with fits of violent delirium, shouting and screaming. The pulse is usually slow and feeble, the skin cool, and the face pale, with a total absence of all signs of inflammation. This condition generally terminates speedily in convulsions, coma and death, unless promptly and successfully treated.

Traumatic Encephalitis.—Inflammation of the brain and its membranes, from injury, is an affection of great importance and frequency. It is a condition that is especially apt to super-

vene in all injuries of the head; though the liability to it necessarily increases with the severity of the accident. This form of inflammation of the brain and its membranes may set in with great intensity in some cases, the symptoms of phrenitis being strongly marked, in other instances, again, it gradually creeps on in a slow and insidious manner, not attracting attention until it has given rise to some severe and ulterior consequences, as effusion or suppuration, when its symptoms become so nearly identical with those of compression and of irritation, as to make a diagnosis of the patient's condition far from simple. The period at which inflammatory symptoms of the brain may manifest themselves, after an injury of the head, varies greatly. In some instances they supervene almost instantly on the patient recovering from the effects of the concussion, the reaction of this state gradually assuming an inflammatory character. In other cases it is not till the lapse of several days that inflammation declares itself; and, again, it sometimes happens that the inflammatory action does not exhibit itself for weeks or even months; but then, occurring perhaps under the influence of comparatively trivial causes, may destroy the patient.

Pathology.—After death, in cases of traumatic encephalitis, we usually find both the brain and its membranes affected. The arachnoid is, however, the structure that seems to suffer most in these cases, being thickened so as to become milky and semi-opaque. Adherent lymph of a greenish-yellow color, and opaque purulent appearance, is seen covering one or both hemispheres of the brain, being deposited in largest quantity at the seat of injury, and not infrequently extending across and into its fissures, occupying especially the depressions at its base. The vascularity of the brain and its membranes is greatly increased, the arachnoid being reddened in patches, and the vessels of the piamater becoming turgid and very numerous, forming a vascular net-work over the surface of the brain. The sinuses are also distended with blood, the cerebral substance exhibits an increase in the number of red points, so as often to present a somewhat rosy hue; and the ventricles are filled with a reddish semi-turbid serum, a large quantity of which is effused about the base of the brain. In some of the more advanced cases, inflammatory softening of the cerebral substance may occur.

Symptoms.—As regards the symptoms of traumatic encephalitis is is useless to endeavor to make a distinction between inflammation of the brain and its membranes, the two structures being more or less implicated at the same time. The most practical division of this disease following injury, is into the acute and the chronic or sub-acute encephalitis.

Acute Encephalitis usually comes on within forty-eight hours after the infliction of injury. The patient complains of severe, constant, and increasing pains in his head, the scalp is hot, the carotids beat forcibly, the pupils are contracted, the eyes intolerant of light, and the ears of noise; the pulse is full, vibrating and bounding; and wakefulness, with delirium, usually of a violent character, speedily comes on. All the symptoms of severe constitutional pyrexia set in at the same time.

This condition may often be conducted to a favorable termination; still the symptoms of inflammation may merge into those of compression; the delirium being replaced, partly or in whole, by a state of stupor, from which the patient is aroused with difficulty, the pupils gradually dilating, the breathing becoming heavy and stertorous, the pulse sometimes continuing with its former rapidity, at others becoming slow and oppressed. The skin is hot but clammy, the patient falls into a dull, heavy, unconscious state, which alternates with convulsive twitchings and jerkings, and occasional delirious outbreaks.

As death approaches the sphincters become relaxed, the pulse more feeble, the surface cooler, and the coma more intense and continuous, until the patient sinks from exhaustion and compression combined. In cases such as these, pus may be found upon the surface, or within the substance of the brain, in one case being diffused, in the other, collected into a more or less distinctly circumscribed abscess. In other cases the compression appears to be induced by a thick layer of lymph lying upon the surface of the brain, or by a quantity of serous fluid being poured out into the ventricles, about the base.

Chronic, or sub-acute Encephalitis, is the most interesting and important variety of inflammation following injuries of the head. It may come on a few days after the occurrence of the injury, or not until months have elapsed. It may arise from

accidents which simply implicate the skull, as well as from those that extend their direct influence to the brain and its membranes. The patient, in many instances, has apparently recovered entirely from the accident, though, in others, it will be found that some one symptom indicative of the brooding mischief still continues, such as headache, impairment of sight or hearing. Occasionally, the coming mischief is foreshadowed by an unusual degree of irritability of temper, by loss of mental vigor, or some other functional disturbance of the brain. In such cases as these the chronic encephalitis may suddenly come on, ushered in, perhaps, by an aggravation of the persistent symptom, or by the occurrence of an epileptic fit. In other cases again, the symptoms set in suddenly without any warning, but usually with much intensity, and speedily prove fatal.

Diagnosis.—The symptoms of chronic encephalitis, when it has fairly set in, consist in those of inflammation, irritation, and compression of the brain conjoined; in some cases one, in other instances another, of the conditions appearing to predominate. The irritation and inflammation proceed from the increased vascular action; the compression from the effusion of serous fluid, of pus, or of lymph, exercising undue pressure upon the brain. There is pain in the head with heat of the scalp, and either dilitation or contraction of the pupils, occasionally one being contracted, the other dilated. Squinting, intolerance of light, delirium, moaning or screaming, unconsciousness, with convulsive twitchings of the face and limbs, commonly occur with the ordinary symptomatic fever; and, lastly, symptoms of coma, rapidly terminating in the patient's death.

Pathology.—The post-mortem appearances are very much the same as in the acute form of the disease, the arachnoid being the structure principally affected. So constantly is this the case, that some surgeons have proposed, and not altogether with injustice, to apply the term *arachnitis*, to this form of traumatic encephalitis, looking upon the arachnoid as the seat of the principal lesion.

The formation of **pus within the cranium** is a point of much interest in these cases, and an effort has been made, especially by Pott, to lay down rules by which the existence of suppuration could be accurately determined. Thus, it has been said, that if,

during the continuance of encephalitis, fits of shivering come on, followed by the gradual supervention of coma, which slowly becomes more and more complete, whilst the constitutional symptoms of inflammation do not subside; and if, at the same time, a puffy swelling forms upon the scalp, and the wound, if any, becomes pale and ceases to secrete, the pericranium separating from the bone, which is seen to be yellow and dry, an abscess will have formed under the skull; and further, that in all probability its seat will correspond to these changes in the scalp and pericranium.

In traumatic encephalitis, secondary mischief often occurs in some of the thoracic or abdominal viscera, the lungs and liver being especially liable to be thus implicated. In the lungs, more particularly, it not infrequently happens that congestion runs into some low form of pneumonia, and thus terminates the patient's existence. In the liver it has long been observed that abscesses are apt to form as a consequence of injuries of the head. These usually occur as one of the more remote consequences of the injury, yet there have been instances of an acute kind. Thus, Hennen relates, the case of an abscess forming in the liver of a temperate woman, thirty-six hours after the receipt of a blow upon the head. This connection between abscess of the liver and injury of the head is doubtless the result of pyemia, consequent upon the suppuration of the diploe of the skull, the hepatic abscess being a metastatic deposit of pus, consequent on an inflammation of the veins of the diploe and of the cerebral sinuses.

Treatment.—The treatment of these various cerebral injuries and the complications that arise, is fraught with no inconsiderable difficulty to the surgeon, in consequence of the indistinctness and want of individuality that mark the existence of these injuries in practice.

In all cases of this nature, the first great indication is to overcome the shock of injury and to re-establish the depressed energies of the circulatory and nervous system; and in doing so, those agents should be employed which are applicable to the treatment of shock generally. If the shock is light, a few words of encouragement and cheer will often have a most salutary effect; and in

addition to this, a little wine, or other stimulating fluid, or perhaps the application of *Ammonia* to the nose will bring about the desired reaction. If the shock is *severe* and the result of a violent injury, the patient should be placed in the recumbent position and blankets be laid upon him, bottles of hot water applied to the extremities, frictions to the surface, etc., etc., and provided the insensibility is not complete, the internal use of *Arnica*, *Camphor* or *Ammonium caust.* be given, according to circumstances. The popular administration of stimulants so injudiciously given in almost all cases of concussion, cannot be too severely reprobated, as they tend not only to excite to an undue pitch the circulating system, but to produce actual mischief in their after effects, frequently confounding the extent of the injury with the stimulating effects of the remedy. If insensibility is complete, all drinks should be prohibited, and *Ammonia* be applied to the nostrils. and a stimulating enema thrown into the rectum. As soon as the patient is able to swallow, *Arnica* should be given internally every ten, fifteen or thirty minutes, according to the severity of the shock, until reaction has been completely established. The early administration of this remedy, if the injury be not too severe, will not only prevent many of the evil consequences that may result, but by its controlling influence over the cerebral vessels, extravasation of blood within the cavity of the cranium will be largely prevented. It is particularly adapted to sanguine plethoric persons, especially when disposed to cerebral congestions following concussion of the brain. The inflammatory mischief that so uniformly accompanies the administration of stimulants under allopathic medication, need not deter the homœopathic surgeon from pronouncing often a favorable prognosis, when the reaction has been brought about by the agents advised. The injurious effects of stimulants upon a depressed nervous organism, driving it from the verge of prostration, as it were, up to the highest grade of vascular excitement, is, I believe, the cause of the serious troubles that so frequently follow the adoption of this treatment. Hence ensue, under allopathic practice, the many dangerous complications that are unknown to those patients who employ homœopathic medication in these injuries.

If, after reaction has been established, the circulation is too

much aroused, *Aconite* or *Gelseminum* become our chief reliance. If impairment of the mental faculties remain after the administration of the above, *Belladonna*, *Opium*, *Cicuta* or *Rhus* may be employed. If *Arnica* has not been already given, this same condition existing, it then becomes a remedy of great efficacy.

If the shock has been attended with great loss of blood, *China* will be demanded. Dr. J. C. Morgan, Professor of Surgery in the Homœopathic Medical College of Philadelphia, highly recommends the use of *Camphor* in concussion following injury, the remedy affording relief, as he remarks, in a few minutes. In those cases where tissues of organic life were specially and severely involved, *Ammonium caust.* has produced marked good effects. In coldness of the extremities, with pallor of the countenance, distortion of the features and rigidity of the muscles, *Cicuta* is indicated.

Veratrum, where there is coldness of the extremities, paleness of the face, distortion of features, relaxed muscles and imperceptible breathing.

Opium will be beneficial to restore the reactive power of the organism, and is especially indicated in a comatose state, accompanied with stertorous breathing, red, bloated countenance, with frequent quivering of the lips; full, slow pulse, and profuse sweat. It is said to act more powerfully when administered by the rectum, in the form of an injection, than by the mouth.

If the disease passes the active stage and assumes a chronic form, the same general plan of treatment as heretofore recommended is to be pursued, modified, of course, by the intensity of the symptoms, and persevered in until all danger has passed, the patient being kept all the while in a state of complete quietude.

Subacute Encephalitis. which occasionally follows injuries of the head, even at a remote period from their infliction, is a most dangerous symptom, and is prone to terminate in a loss or impairment of sense, in diminution of intellectual power, or in paralysis. In such cases the disease must be treated in accordance with the totality of symptoms presented, it being impossible in this connection to do more than to recommend the remedies best adapted to the cure of the condition involved. The remedies

most to be relied upon are *Arnica*, *Aconite*, *Arsenic*, *Apis mel.*, *Belladonna*, *Bryonia*, *Cimicifuga*, *Cicuta*, *Gelseminum*, *Ignatia*, *Nux vom.*, *Hyosciamus*, *Opium*, *Stramonium*, *Zincum*, *Veratrum viride*, which may be selected in accordance with their indications, a few of which are annexed.

Aconite—full and bounding pulse, increased heat of the body and face, anxiety and fear of death, palpitation of the heart, anguish, loud moaning, oppressed breathing, great restlessness.

Belladonna—when there is hot and red face, dilated pupils, sparkling eyes, anguish in the precordial region, melancholy, depression of spirits, rage, biting at persons, dryness of the fauces, violent redness of the face, symptoms aggravated by movement of the head.

Bryonia—feeling as if the brain would protrude through the cranium, great irritability and fits of anger, dread of the future, cold sweats on the forehead and head, nausea and fainting in the erect posture, bloated and hot face, pains increased by motion.

Cimicifuga—great sensitiveness to cold air, continual restlessness, nervous tremors, feeling of dejection, dizziness, vertigo, dullness in the head and intense pain in the vertex, as if a bolt was driven through it; delirium, sighing, followed with mirthfulness; intense pain in the eyeballs.

Gelseminum—nervous exhaustion, pulse frequent, soft, weak and fluttering, dull frontal headache, complete loss of muscular power, respiration labored and feeble, nausea and vomiting.

Hyosciamus—delirium, unconsciousness, convulsions, double sight, red sparkling eyes, face red, numbness of the hands, involuntary discharge of feces.

Opium—coma, stertorous breathing, open eyes, dilated pupils, slow pulse, red face, slow irregular breathing, sinking of lower jaw, hot sweat on the head, foaming mouth, convulsed extremities.

Stramonium—unconscious and senseless, loss of sight and hearing, face red and tinged with blood, convulsive motions of the head; wild, stupid expression, great thirst.

Veratrum—sense of weight, fullness and distention in the head, intense headache, throbbing of the arteries, stupefaction, nausea, vomiting, tingling numbness in the limbs, mental confusion, loss of memory.

Irritation of the brain, which occasionally occurs as the result of injury, must be treated in accordance with the symptoms manifest in each case.

It is a disorder that comes more especially under the notice of the physician, and the reader is referred to the different works on practice for extended observation and treatment.

Compression of the brain, unlike that of concussion, occurs as the result of inflammation in the cranium. If notwithstanding the previous treatment for concussion the disease remains unchecked, rigors occur and coma supervenes, conjoined with a certain amount of continuous inflammation. The question presented to the surgeon is whether the compression depends upon the formation of purulent deposit within the cranium or not. There are no absolute and unequivocal symptoms indicative of the presence of pus within the cranium as contra-distinguished from the effusion of serum, or of puriform lymph on the brain or its membranes. It not infrequently happens, however, that he is enabled by the assemblage of general symptoms and local signs, to determine its existence with considerable accuracy, whether the pus be between the cranium and dura mater, between the layers of the arachnoid, underneath this membrane, betwixt the cerebal convolutions, or deeply situated in the substance of the brain. For the purposes of treatment, however, it is of little importance to the homœopathic surgeon, in what situation this purulent matter may have been deposited. The symptoms and the general history of the case must determine the remedy to be employed. For the remedies appropriate to this condition, the reader is referred to the article on inflammation and its treatment, vol. 1, page 194, the remedy or remedies being selected according to its pathogenesis, which is more clearly pointed out in our materia medicas. The operation of trephining in such cases, as recommended by some surgical writers, has not found favor in the profession, although Dupuytren, after trephining a case of this kind, plunged a bistoury into the substance of the brain and thus *luckily* relieved his patient, suffering from an abscess in this situation. Mr. P. Hewitt has justly stated that the successful termination of a case of trephining for matter between the skull and dura mater, is all but unknown to surgeons of the present day. Of one thing

we are certain, that if an operation of the kind is performed and pus is found under the cranium, between it and the dura mater, and is evacuated, the encephalitis consequent upon the procedure will most probably terminate the patient's life.

Abscess of the brain, or *softening*, may follow as remote consequences of injury, and in such cases it appears obscurely and insidiously. The first evidences are occasional headache, general loss of strength and health; impairment of the memory, or other mental faculties, furred tongue, quick pulse, derangement of the eyes or ears, a sense of coldness or constriction in the scalp, with creeping in the limbs and numbness, are the most frequent evidences of its existence. These symptoms may in time be succeeded by sudden convulsions, paralysis or coma, from which the patient may partially recover from time to time under successful homœopathic treatment, but too often the result is fatal.

Treatment.—The treatment of this affection is pointed out under the head of Textural Changes, vol. 1, page 329.

CHAPTER II.

INJURIES OF THE SCALP.

The scalp is liable to become affected by any of the varieties of injuries previously named, such as contusions, incised, lacerated or punctured wounds. In order to treat skillfully the wounds that may occur in this region, it is necessary that the surgeon be thoroughly acquainted with the general structure of the component parts of the head, and especially should he have correct knowledge of the situation of the blood-vessels ramifying beneath the scalp, as for example the occipital and temporal.

Owing to the great vascularity and consequent active vitality of the integuments of the head, the scalp is not readily induced to slough. The complication which is to be particularly guarded against, is erysipelas.

Contusions of the Scalp are apt to be followed by consider-

able extravasation of blood, raising the scalp into a soft semi-fluctuating tumor. It occasionally happens, especially by blows on the heads of children, that this circumscribed tumor, being soft in the center and comparatively hard toward the circumference, is mistaken for a depressed fracture of the cranium. And even in some cases this deceptive feeling may occur without any infiltration of blood, the depressed center being due to the compression of the scalp by the blow inflicted upon it. A correct diagnosis, however, can be made by attempting to detect fluctuation, or by passing the fingers, firmly pressed upon the scalp, from the circumference of the tumor to its center, when, if a depression really exist, it can be felt.

The *treatment* consists in the application of cold medicated lotions to the part, such as is recommended for contused wounds, vol. 1, p. 644. *Aconite* or *Arnica* and water, in the proportion of one part of the tincture to nine parts of water, will tend to prevent inflammatory action and promote absorption of the extravasated fluid. Provided, however, erysipelas should supervene, the previous dressings should be discontinued, and *Belladonna*, *Rhus tox.* or *Cantharis* substituted. In no case should a puncture be made for the purpose of letting out the blood.

Wounds of the Scalp are of frequent occurrence, and are more serious than corresponding injuries elsewhere, especially so when occurring in persons about the middle period of life, and of unhealthy or broken constitutions. It is not only that these injuries are more likely to be followed by erysipelas than those of other parts of the body, but it is also to the greater tendency to the propagation of inflammatory mischief inwards to the brain, and to the complication of cerebral difficulty so often accompanying comparatively slight injuries of the scalp, that these accidents owe much of their serious and often fatal character. Though there be danger to life in this class of wounds, there is, as before remarked, comparatively little apprehension as regards the scalp itself; the abundant supply of blood it receives from closely subjacent arteries, and its consequent great vitality, is the reason why sloughing so seldom occurs, even though the part be bruised and seriously lacerated.

The treatment of wounds of the scalp necessarily varies with

the nature of the injury. If it be an incised wound, it may be advisable in severe cases to shave the scalp in this vicinity, and approximate the edges by the use of adhesive strips, sutures being highly objectionable. In ordinary cases the lips of the wound may be kept in apposition by a couple of light compresses, retained by means of the recurrent bandage of the head; or the hair may be parted in the direction of the wound, and then parts of it crossed and tied, or it may be held in position by using a compress and bandage, without tying. The external applications will consist in the use of such lotions as have already been named as applicable to wounds of this kind, not forgetting at the same time to pay special attention to the state of the brain.*

In lacerated wounds it frequently happens that a large flap of integument is stripped off the cranium, and is thrown down over the face or ear, so as to denude the bones. In these cases advantage is taken of the great vitality of the scalp, for however extensively contused or lacerated this may be, however much it may be begrimed with dirt, it is a golden rule in surgery not to cut any of it away, but after suppressing the flow of blood and shaving the part, to wash and clean it thoroughly, and replace it in its proper position. It is now to be supported by a few strips of adhesive plaster, and in rare cases a *metallic* (silver) suture or two may be used. Water dressing must now be applied, medicated with *Hypericum* or *Calendula*,† and the constitutional symptoms carefully watched and met by appropriate treatment, as recommended in the directions given under traumatic affections of the brain. In this way union will be likely to occur very readily; but in the event of suppuration becoming somewhat profuse, the pus must be prevented from burrowing beneath the aponurosis of the occipito-frontalis muscle, by making early counter-openings, and by the employment of compression in various directions. The pus has a special tendency to gravitate into the upper eyelid whenever suppuration takes place beneath the frontal portion of the muscle, and here the counter-opening may be conveniently made.

---

* See vol. 1, page 685, "Incised Wounds."

† See Lacerated Wounds and their treatment, vol. 1, page 643.

Other varieties of wounds of this region are to be treated on the general principles already given.

§ 2.—WOUNDS OF THE BRAIN AND ITS MEMBRANES.

Wounds of the brain and its membranes constitute one of the most serious complications arising from injuries of the head. The extent of injury inflicted upon the cerebral substance has wide limits, from slight laceration without exposure, to denudation of the brain, disintegration, and escape of large portions of its pulp. Injury to the brain may be occasioned in various ways. The simplest form is that, perhaps, which is not infrequently met with in undepressed fractures of the skull, and sometimes without fracture, from simple concussion or commotion of the head, laceration of the cerebral substance occurring either under the seat of injury, or more frequently at a distant or opposite point, by a kind of *contre-coup*. Laceration of the brain by a counter stroke, is by no means of rare occurrence, being one of the most common causes of death in simple fracture of the skull. It is attended by much extravasation of blood, and after death the brain substance is found mixed up with coagula, and forming a soft, pulpy, bloody mass. This accident may occur without any fracture of the skull, or external sign of serious injury, and usually results from falls upon the sides or back of the head, often from an inconsiderable hight, as in a person falling upon a slippery pavement; when the anterior or the opposite portions of the hemispheres of the brain will be found in the condition just described.

The brain and its membranes are often injured by sharp spiculæ of bone projecting from a depressed fracture, which may penetrate to a considerable distance into its substance. And lastly, the injury may be occasioned by foreign bodies, such as bullets, traversing and lodging in the head, or by stabs or punctures through the thinner portions of the skull, especially the orbital plate of the frontal bone. In this way pieces of stick, tobacco-pipe, the point of a knife, may puncture the anterior portion of the brain.

The symptoms of wound or laceration of the brain vary greatly according to the age of the patient, the seat of injury, and other conditions, which cannot very readily be determined. If the injury implicates those portions of the nervous center at the base of the

brain, the integrity of which is necessary for the maintenance of respiration, immediate death must unavoidably ensue. If, however, portions of this organ which are less vital, as the anterior lobes and the upper part of the hemispheres, are injured, but very slight symptoms may occur, and in some cases, indeed, there are no indications by which this injury of the cerebral substance can be positively determined, except by its exposure and escape through the external wound. Hence, it is that even the worst injuries of the head are rarely immediately fatal, the patient being seldom killed outright, unless the medulla-oblongata be wounded. Children, especially, have been known to bear extensive injuries of the brain, and even the loss of considerable cerebral matter without any very serious effects, either immediate or remote; and it is by no means of uncommon occurrence to see them live for several days with an extent of injury to the brain, that would rapidly have proved fatal to an adult.

Twitching of the muscles and epileptiform fits are commonly met with when the brain is lacerated, and this, complicating the trouble, or alternating with it, indicates the nature of the mischief.

Foreign bodies, even of large size and considerable weight, have been lodged for considerable time within the cranium, in contact with the brain, without occasioning death. Hennen states that he has seen five cases in which bullets were lodged in the cranium, that did not prove immediately fatal. Cunningham relates the case of a boy who lived for twenty-four hours with the breech of a pistol, weighing nine drachms, lying on the tentorium and resting on the occipital bone. O'Callaghan records the case of an officer who lived for about seven years with the breech of a fowling-piece, weighing three ounces, lodged in the forehead; the right hemisphere of the brain resting on the flat part, from which it was separated by a false membrane. A still more severe injury is reported by Prof. Bigelow, of Harvard University, in which a "tamping-iron" that weighed thirteen and a quarter pounds, three feet seven inches long, and one inch and a quarter in diameter, was driven, by a premature explosion, through the cranium, in a straight line from the angle of the jaw on one side to the centre of the frontal bone above, near the saggital suture, where it emerged, passing some rods distant, smeared with blood

and brains. The patient recovered from this most remarkable lesion with the loss of sight of the injured eye only.

From the great variety of effects produced by these injuries, it must be evident that there can be no one set of symptoms indicative of wound of the brain, unaccompanied by an external wound through which the condition of the cerebral substance can be ascertained. In those cases in which this does not exist, we can at least only suspect laceration, if we find that the ordinary symptoms of compression or concussion are associated with signs that do not usually occur in those conditions when uncomplicated, such as the contraction of one pupil, the dilatation of the other, and perhaps an alternation of these states with twitchings of the limbs, hemiplegia, paralysis of an arm, and of the opposite leg, with perhaps involuntary spasmodic movements of the other members. These irregular symptoms, when accompanied by coldness of the surface, and depression of vital power, may generally be looked upon as indicative of cerebral laceration.

Wounds of the dura mater are always liable to be followed by symptoms of the most serious character, and are seldom recovered from, diffuse meningitis, the formation of pus within the cranium usually occurring, and speedily terminating the patient's existence. Recoveries, however, do sometimes occur.

Wounds of the brain may prove fatal immediately by the injury inflicted to the respiratory tract, by the continuance of the shock, or by an extravasation of blood within the cranium; or, at a later period, by the occurrence of encephalitis and its consequences; or, more remotely still, by the supervention of paralysis and other ulterior effects of injury to the nervous system.

Treatment.—In the treatment it is of the first consequence, after the system has recovered from the shock, to remove all sources of irritation and excitement from the patient, keeping him as quiet and comfortable as possible, in both mind and body. Cooling applications of *Hypericum*, *Staphysagria* or *Calendula* should be made to the head, and the peculiar constitutional symptoms that arise combatted by the use of those remedies that are demanded to meet the particular indications of each case, which are more particularly pointed out in "Inflammation" and its treatment, vol. 1, page 228.

If any foreign body be lodged within the cranium, it must, if possible, be removed. This may be effected if the substance be situated near the external wound, or fixed in the bones, but if it have penetrated deeply into the brain, without going beyond the limits of the external wound, it would be perhaps more dangerous to trephine the skull on the chance of reaching it, or to search for it in any other manner, than to leave it where it is.

Fungus, or Hernia Cerebri.—Hernia of the brain may occur from the operation of trephining, syphilitic caries, or absorption of the cranial bones, though in most cases it is due to a laceration of the brain and dura mater communicating with a fracture of the skull. It is occasionally found, especially in children, that a bloody, fungus-looking mass of cerebral matter projects from the wound. This tumor increases quite rapidly, pulsates synchronously with the brain, and may shortly attain the size of a hen's egg, or even become larger. It is composed of softened and disintegrated matter, infiltrated with lymph and blood. This softening of the brain, with red discoloration of its substance, extends for some little distance under the base of the tumor.

The mental condition of a patient laboring under this affection is in many instances not much disturbed at first, there being merely some degree of cerebral irritation. Speedily, however, stupor comes on, and death eventually occurs from coma.

Treatment.—When hernia of the brain occurs after the operation of trephining, from caries, or from fracture of the skull, and there is reason to anticipate the formation of granulations, a moderate amount of pressure may be employed, taking care that no rupture of the dura mater occurs, to allow the escape of the contents of the cranium. If a hernia forms, it may be removed by the application of a ligature, which should be cautiously tightened each day until the whole has sloughed off. If the tumor be shaved off it usually returns again, until the patient is destroyed by irritation and coma conjoined. After using the knife, a little *Hypericum* lotion may be applied to the cut surfaces, and a light compress, saturated with a lotion of this remedy, retained over the wound by means of a bandage.

Caustics should never be employed to remove a tumor of this kind.

When there is an escape of softened, disintegrated cerebral matter, it is to be sliced off on a level with the brain, and a pledget of lint wet with *Hypericum* lotion applied, with a compress and bandage, over the part, thus permitting it to granulate and the wound to cicatrize.

§ 4.—EXTRAVASATION OF BLOOD WITHIN THE SKULL.

This condition occurs in all those cases of injuries involving laceration of the brain, and may result from fracture of the skull without any injury done the membranes. Extravasation is one of the most frequent causes of death after injury, which is due to the pressure occasioned by the clot upon the brain. The extravasation may occur in four situations:

1st. Between the dura mater and the skull, where it is most likely to occur;

2nd. Within the cavity of the arachnoid;

3rd. Upon the surface of the brain; or,

4th. Within its substance and its ventricles.

It is usually the most considerable when poured out upon the dura mater, or within the cavity of the arachnoid at the base of the brain. It is in smallest quantity immediately on the surface of that organ, or within its substance. It is, however, seldom found in the latter situation as the result of violence, without being met with more superficially. Except from rupture of the meningeal artery, the quantity effused scarcely ever exceeds three or four ounces.

Its symptoms are often obscure, resembling in the early stages those of compression, and at a later period those of encephalitis. Placing out of view the complications that arise, the symptoms indicative of compression of the brain from extravasated blood manifest themselves in two ways. In the first, or *meningeal* variety, there are three distinct stages, viz.: 1st, Concussion; 2nd, A return to consciousness; and, 3rd, Coma gradually supervening. The patient receives a blow, becomes stunned and insensible, with cold clammy skin and quick pulse. In a short time he recovers his consciousness; then, in a few hours, becomes drowsy and dull, with a slow full pulse, dilated pupils and a tendency to coma; as compression increases, complete

stupor sets in, with stertorous breathing and terminating either in complete or partial paralysis. If, on the other hand, a large quantity of blood is extravasated rapidly, the symptoms of compression merge into those of concussion, without an interval of consciousness. In these cases the paralysis is partial and associated with twitchings of the body generally, with restlessness and incoherent mutterings, and dilatation of the pupil on the side most convulsed. In the latter case the extravasation is *cerebral* and connected with or dependent upon laceration or disorganization of a portion of the brain.

The **diagnosis** of these two forms of extravasation from one another is important, as it is only in the meningeal that any operative procedure can be successfully undertaken, and it may usually be readily effected by attention to the symptoms just detailed.

The diagnosis of the compression from extravasation, and that from depressed bone or inflammatory effusions within the cranium, is easily made. In the case of depressed fracture, we have symptoms of compression continuing uninterruptedly from the very first, and proper examination of the cranium will always lead to the detection of the injured bone. When inflammatory effusions, whether of pus, lymph, or serum, exercise undue pressure upon the brain, we find that the signs of compression have been preceded by symptoms of cerebral inflammation, and that they are accompanied by a good deal of pyrexia, by quick pulse and hot skin; the character of the scalp wound likewise, and the separation of the dura mater when pus is effused, enable us to distinguish this condition from those cases in which the pressure is the result of extravasated blood.

From apoplexy, the diagnosis is not always easily made, more particularly when there is no evidence that the head has been injured. A history of the case is necessary in order to arrive at an intelligent conclusion.

From the insensibility of drunkenness the coma resulting from injuries may be distinguished by the absence of local mischief, by the smell of the breath, by the face being flushed and turgid instead of pale, as is the case in persons suffering from injury.

When a drunken person has met with an injury of the head

and is insensible, he should always be carefully watched, however slight the injury may appear to be, until time sufficient has elapsed for him to recover from the drunken fit, as it is impossible to say whether the stupor be the result of intoxication or of mischief within the cranium, so long as the effects of the liquor are present.

Treatment.—The treatment of extravasation of blood is to be conducted upon two principles: 1st, The general and local measures, having for their object the arrest of further hemorrhage, the promotion of absorption, and the subduing of inflammatory action. 2nd, The application of the trephine with the view of allowing the escape of the effused blood.

As regards the *operation of trephining*, it is quite evident that special reference must be had to the character of the symptoms; for when these indicate the *cerebral* form of extravasation, trephining can be of no service. But when the extravasation seems to be *meningeal*, the attempt might be successfully made to evacuate the extravasated blood.

Formerly the operation of trephining was resorted to much more frequently than it is by modern surgeons; and this procedure would still be most applicable, could it be ascertained without doubt that the extravasation is not only of a meningeal character, but that the blood is so situated that it may be removed through the trephine aperture, and that there are no other serious injuries to the skull or brain. But notwithstanding the uncertainties and difficulty of arriving at a correct diagnosis, still it is probable that cases do occur occasionally in which, from the situation of the blow, and perhaps of a capillary fissure over the course of the middle meningeal artery, the gradual supervention of the signs of compression, after an interval of consciousness, and the occurrence of hemiplegia in the side opposite to that receiving the blow, the surgeon is warranted in making an aperture in the skull at the seat of injury, in order to remove the blood that has been effused, and to arrest its further extravasation. But the instances in which this assemblage of symptoms could exist with sufficient precision to justify an operation, are exceedingly rare. The most serious objection to the application of the trephine in cases of extravasation, does not consist so

much in determining the existence of effused blood within the cranium, or that the extravasation is of the meningeal form, but rather in diagnosing that it is so situated between the dura mater and the skull as to admit of removal; not being effused at the base, or so widely coagulated over the brain as to be unable to escape through the aperture that may be made. Also the likelihood of the co-existence of fracture of the base of the skull and of laceration of the brain, giving rise to the cerebral form of extravasation, must be taken into account. If, however, the symptoms are urgent, and pretty clearly indicate the meningeal form of extravasation, and more especially if there be hemiplegia on the side opposite to that on which the blow was inflicted, with an injury in the course of the middle meningeal artery, the trephine may be applied at the seat of injury in hope of relieving the patient. It must be borne in mind that however clear the signs, the extravasation may not be found where the surgeon expects to find it. Under these circumstances it is better not to prosecute the search by making fresh apertures.

The *general measures* to be adopted will consist in making cooling applications to the head, with gentle pressure on the part, in order to promote absorption, meeting the constitutional symptoms by internal remedies suited to the peculiar indications, and keeping the patient on a low diet. The remedies capable of exercising control over internal hemorrhage are: *Aconite*, *Arnica*, *Belladonna*, *China*, *Crocus*, *Crotalus*, *Erigeron*, *Ferrum*, *Hamamelis*, *Ipecac*, *Phosphorus* and *Secale cor.* See Hemorrhage from Wounds, vol. 1, p. 625.

SECTION II.

INJURIES OF THE SPINE.

Injuries of the Spine, like those of the head, derive their importance from the degree to which the inclosed nervous centers are implicated. The spinal cord is subject to *concussion*, *compression* and *inflammation*, as the result of external violence, and any of these conditions may occur without injury to the osseous and ligamentous structure investing it, although in the

majority of cases, they are directly occasioned by fracture or dislocation of the vertebræ. It may also be partially or completely divided by cutting instruments, gun-shot wounds, or a broken vertebra.

Concussion of the spine varies greatly in severity. In many cases of falls from a hight, and of blows upon the back, the patient complains of great pain at some part of the spine, inability to stand, and a certain degree of weakness of the lower extremities. In these cases, rest for a few days in bed, with a few doses of *Arnica*, *Camphor*, *Aconite*, or *Belladonna*, will speedily remove the symptoms.

In other cases, however, the symptoms, slight at first, quickly become much increased in severity, or may, from the commencement, assume a serious character. In such cases there is some pain at the seat of injury, below which there is more or less paralysis, sometimes consisting in mere debility, or in impaired mobility of the lower limbs, at others, loss of sensibility and motion. The sphincters are always affected, there being more or less incontinence of flatus and fæces, and some difficulty in emptying the bladder, amounting, at last, to complete retention of urine. These symptoms may, after continuing some weeks or months, gradually lessen in intensity until mere debility is left, which is apt to continue for a considerable time. In other cases again, they continue permanently, or terminate in speedy death.

In the more chronic forms of this affection, *traumatic myelitis*, usually of a fatal character, is apt to come on. In these cases there is paralysis of the parts below the seat of injury, associated with pain and twitching of the muscles, the pain in the back being much increased on pressure.

Pathology.—After death in cases of concussion of the spinal cord, every condition is found between slight ecchymosis, with some redness of the membranes, through all the gradations of softening, up to complete disorganization of its structure. In many cases there is extravasation of blood into the substance of the cord itself. When this occurs, the clot is most commonly found in the gray substance, or if not actually confined to this, at all events, towards the center of the cord and opposite the seat of injury. Occasionally the blood is effused largely into the

spinal canal, compressing the cord, and thus occasioning gradually increasing paraplegia. It may also happen as the result of a strain. When myelitis has occurred, the membranes are found congested and sloughy, and the cord itself in every degree of red softening, up to complete liquefaction.

Treatment.—The treatment of concussion of the spinal cord must be conducted upon the same general principles as that of concussion of the brain, page 131. The patient is to be kept in the recumbent position until the lower limbs have regained their power. *Arnicated* or *Hypericum* lotions should be placed over the seat of injury, the urine should be drawn off at stated intervals, the lower bowels be relieved by enemas, and the strength sustained by nourishing diet, which should be kept up so long as the paralysis continues. The internal treatment must be conducted upon the same general principles already alluded to in "Injuries of Soft Tissues," vol. 1, p. 614.

Wounds of the spinal cord may occur from stabs with pointed instruments, from gun-shot violence, or more frequently from injury inflicted upon it by the pressure of fractured vertebræ.

In the latter case, there is an association of wound and compression, giving rise essentially to the same symptoms as if the cord were divided.

When the cord is completely divided, a certain set of symptoms occur which are common to all cases, at whatever part of the cord the injury may have been inflicted, provided it be not so high as to cause instant death.

In the first place there is complete paralysis of sense and motion in all parts below the seat of injury, though the mental manifestations continue intact. The precise seat of the injury may often be diagnosed by the extent of the paralysis. Thus in injury of the lower part of the spine, there may be paralysis of all those parts supplied by the sacral plexus, whilst those from the lumbar are not affected, the sensibility being lost below the knees, whilst above it is perfect—thus leading to the inference the injury has been inflicted above the one and below the other set of nerves. The temperature of the part becomes lowered; though in some cases when the paralysis is not quite complete, the reverse has been observed; and after a time, a visible diminution takes place

in its nutritive activity, the circulation becoming feeble, with a tendency to congestion at depending points.

This lessening of nutritive vigor is not, however, confined to the paralyzed parts, but the whole of the system participates in it, the patient becoming speedily anemic and cachectic. The skin assumes a dirty, cadaverous hue, and the cuticle usually exfoliates in branny flakes.

These general symptoms of paralysis as the result of injury present important modifications, according to the point at which the cord is divided.

Injury in the lumbar or lower part of the dorsal region will be attended by complete paralysis of all the parts supplied by the nerves given off from the sacral or lumbar plexuses, or both; hence there will be paralysis of the lower extremities, of the genital organs, and of the trunk as high as the seat of injury. There is always in these cases relaxation of the sphincter ani, and hence incontinence of flatus, and, to a great extent, of fæces. There is, at first, retention of urine, in consequence of the paralyzed state of the bladder, the body of which is unable to expel its contents; after a time, however, the urine dribbles away as fast as it is poured into this over-distended organ, the neck of which has lost its contractile, sphincter-like action. After the first few days the urine will be observed to be ammoniacal in odor and alkaline in reaction. This is probably owing to changes effected after it has entered the bladder, the mucous membrane of which becomes chronically inflamed, secreting a viscid, alkaline muco-pus, which mixes with the urine. In the early stages of the accident the penis will be observed to be in a state of semi-erection. Patients who have met with injuries of this portion of the spinal cord may live for many months, and even for a year or two, but eventually die, usually with sloughing of the nates, or from the intervention of some visceral inflammation of a low type.

If the upper dorsal region be divided at about the level of the third dorsal vertebra, we have not only the train of symptoms that has just been mentioned as characteristic of this injury lower down, but another set of symptoms is superadded to them, owing to the respiration being interfered with, in consequence of the

paralysis of the greater portion of the expiratory muscles; the intercostals, and those constituting the abdominal wall, no longer acting, and imperfect expiration is effected solely by the elasticity of the walls of the chest; and those expiratory movements, such as sneezing and coughing, which are of a muscular character, cannot be accomplished. In these cases it will be noticed that, during inspiration, which is effected almost exclusively by the diaphragm, the ribs are depressed instead of being expanded and raised, and the abdominal wall, which is soft and flaccid, is protruded far beyond its normal limits. In consequence of the impediment to respiration, the blood is not properly arterialized, and a slow process of asphyxia goes on, usually running into congestive pneumonia, and terminating fatally in fifteen or twenty days.

Where *the lower cervical vertebræ* are injured, not only do all the preceding symptoms occur, but there will be paralysis of the upper extremities as well, and the inspiration being entirely diaphragmatic, the circulation speedily becomes affected, the countenance assuming a diffused and purplish look. If the cord have been divided immediately above the brachial plexus, the whole of the upper extremities will be completely paralyzed, but if the injury be opposite the sixth cervical vertebra, it may happen that the upper extremities only are paralyzed.

Division *above the origin of the phrenic nerve*, opposite to or above the third cervical vertebra, induces instantaneous death from paralysis of the diaphragm, as well as of the rest of the respiratory muscles.

It occasionally happens in partial division of the cord, as in some cases resulting from fracture, that the symptoms are not so clearly marked, as would appear from the description just given. Thus for instance the paralysis may not extend to all the parts below the injury; it may be attended by severe pain in some of the semi-paralyzed parts; or, motion may be affected in one limb and sensibility in another. These deviations from what is usual may be explained by some peculiarity in the seat of the injury to the cord, or by the extent of its division.

Treatment.—In regard to the treatment of wounds of the spinal cord, nothing of a definite character can be suggested;

every case will require to be managed according to its own peculiar nature. The great object of the surgeon is to moderate inflammation and prevent effusion and other ill effects. In a very violent injury of the lumbar spinal cord, terminating in paralysis of the parts supplied by the nerves given off at the point of injury, I found the most satisfactory results follow the internal and external use of *Hypericum per.* In two weeks the patient regained his power of locomotion, and in three weeks all the functions of the body hitherto lost had completely recovered, and up to the present period he enjoys complete and uninterrupted health. I believe the remedy to possess valuable curative properties in injuries done to the cord, and have no hesitation in recommending it for such conditions. If foreign matter is present and pressing upon the cord, it should, if possible, be removed, though in attempting to do this there is great risk of increasing the original trouble. Trephining has been tried without success in a number of cases in depressed fracture of the vertebræ, and is now, I believe, altogether abandoned.

Myelitis.—Inflammation of the spinal cord, termed *myelitis*, belongs rather to the province of the physician than the surgeon, and the reader may therefore very properly be referred to its treatment in the works on medical practice. The chief remedies in its treatment are *Belladonna*, *Conium*, *Mercurius*, *Phosphorus*, *Secale cor.*, *Silicea*, *Sulphur* and *Veratrum.*

SECTION III.

INJURIES OF THE FACE.

Injuries about the face and forehead present nothing very peculiar, except that they partake of the same tendency to ready repair as is observed in the scalp, as well as to the supervention of erysipelatous inflammation. Their usual danger, however, is from hemorrhage, which is often remarkably free, notwithstanding there are no vessels of any considerable size to be wounded in this part. More or less difficulty may also be encountered through a loss of the function of the nerve wounded. It is therefore proper that

these wounds should be carefully watched. Owing to the situation of wounds of the face it is desirable to conduct the treatment so as to leave as little scarring as possible. Hence the edges, after being well washed in cold water, should be brought neatly into apposition, by fine hare-lip pins and the twisted suture, or by a few points of interrupted suture, using strips of adhesive plaster as an additional support if required. Should they occur in the neighborhood of the eyelid, especial care must be taken to prevent any loss of substance, lest the contraction of the cicatrix produce eversion of the lid. In those cases in which a portion of the nose or lip has been lost, much can be done by way of repair, by resorting to properly conducted plastic operations, which will be described hereafter.

Salivary fistula sometimes results from wounds dividing the parotid duct, in consequence of which they do not heal, owing to a trickling of saliva on the outside of the cheek, which is a source or much annoyance and disfigurement. The surface surrounding the orifice thus occasioned is puckered and somewhat excoriated, the opening itself presenting a granulating appearance. Provided this condition be recent, a cure can sometimes be accomplished by paring the edges of the wound, bringing them into close apposition, and applying moderate pressure on the part. In cases of long standing, it may occur that the opening into the mouth has become closed, when it will be necessary to make an artificial orifice, which may be accomplished by the use of a seton. After the course of the saliva has thus been directed into the mouth, the external wound may be closed.

Other fistulous openings may also occur in the cheek, as the result of injury or disease, so as to allow the escape of small quantities of saliva. They are always more or less difficult to heal; the edges becoming callous, and not readily taking on the reparative process. Hence it may sometimes become necessary to set up a new inflammatory action by the use of caustics; though as a general rule, making the opening free, excising the edges, and properly coaptating the raw surfaces, will effect a union.

Injuries of the **Eyeball** are so commonly followed by impairment or total loss of vision as to constitute a very important series of accidents; the delicacy of the structure of this organ being

such, that slight wounds of its more transparent parts, or displacement of the lens, is followed by complete opacity and loss of sight.

In *contusion* of the eyeball without rupture, concussion of the retina may be followed by temporary or permanent amaurosis, More frequently contusions of the eye are accompanied by extravasation of blood under the conjunction, and much ecchymosis of the eyelids.

In contusion with rupture, the cornea may be torn, the humors lost, and vision permanently destroyed. The rupture, however, is more frequently internal, the outer tunics escaping all injury. In this case there is extravasation of blood into the anterior chamber, hiding and complicating deeper mischief within the ball. This condition, termed *hæmophthalmia*, is frequently associated with separation of the ciliary margin of the iris. Or there may be displacement of the crystalline lens, which may be drawn into the vitreous humor, be engaged in the pupillary aperture, or fall forwards into the anterior chamber. As a consequence of such injuries, severe pain, inflammation, disorganization, and loss of vision, often ensue.

Wounds *of the eyeball* may be divided into those which are merely superficial, and those that perforate its coats.

The *non-penetrating wounds* are usually inflicted by iron-filings or other small metallic bodies, which become fixed in the cornea. The first points to be observed in the treatment is to remove the foreign substance, which, if it be imbedded in the cornea, can usually be picked out with the point of a lancet or a cataract needle. The slight brown stain that will be left after the removal of spiculæ of iron, are not to be regarded as in the least alarming, from the fact that it will disappear in a few days. The manner of everting the eyelid has been described in vol. 1, p. 184.

Penetrating wounds of the eyeball are inflicted by pointed agents, as sharp bits of stick, steel pens, by fragments of gun-caps, etc., and are exceedingly dangerous to vision; and in case the offending substance becomes lodged in the wound, it is probable the sight will be permanently lost. The danger which is likely to ensue arises from the escape of the humors, or from a hernial

prolapse of the iris through an accidental opening in the cornea. The more remote consequences are due to the inflammatory action that is set up, producing an opaque cicatrix of the cornea, or of the capsule of the lens; or adhesions may form, stretching across between the iris and the lens, or between these parts and the posterior surface of the cornea; or the inflammation may be so violent as to produce disorganization of the eye.

Treatment.—The treatment of *penetrating* wounds of the eyeball consists mainly in keeping down subsequent inflammation, the general principles of which are laid down in vol. 1, p. 646, entitled "Punctured Wounds." If the wound has produced a protrusion of the iris through the cornea, it should be carefully returned and a drop or two of the solution of *Atropine* placed upon the eye. If it cannot be replaced, removal may be effected with a pair of fine curved scissors, and if at a later period any staphylomatous tumor present, it should be touched from time to time with a pointed piece of nitrate of silver. If a tendency exists to the formation of adhesions, or to the deposit of lymph within the pupil or anterior chamber, our principal reliance will be upon the administration of *Mercurius*, *Jodium*, *Hepar*, *Conium*, *Euphrasia*, *Ruta* or *Staphysagria*, internally, conjoined with external applications of *Ledum*, *Staphysagria* and *Calendula*, as called for by the assemblage of symptoms in each case. If the lens or its capsule have become opaque, producing traumatic cataract, it must be removed as will be hereafter pointed out in diseases of the eye.

The treatment of *non-penetrating* wounds, after the removal of any foreign body that has been lodged, will be conducted on the same principles laid down in "Injuries and Contusions of the Soft Tissues," vol. 1, p. 620.

Wounds of the Tongue are not very often met with, but when they do occur are generally the result of a bite inflicted by the patient himself when in convulsions, or they may be produced by balls. In cases where the deeper seated portions of the organ are wounded, the hemorrhage will be found quite profuse and troublesome. Under these circumstances it will be necessary to hook the tongue with a tenaculum, in order to control it while the bleeding is controlled by the application of a ligature. If

the wound be quite extensive, it may be required to employ sutures, which will have to be numerous and passed deeply, owing to their tendency to cut through the tender tissue of the tongue. In superficial wounds of this organ, the hemorrhage may be controlled in most cases by the application of styptics, as recommended under Means of Arresting Hemorrhage, vol. 1, p. 164.

SECTION IV.

WOUNDS OF THE NECK.

Wounds of the Neck are dangerous according to their situation and depth; thus, wounds inflicted on the front of the neck implicate more important structures than those on the back of this region; while the deeper the wound, the more serious the injury. Superficial wounds of the neck may also become dangerous in consequence of suppuration, the pus having a tendency to burrow into the deeper structures, especially under the reflections of the cervical fascia.

All the injuries of this region, however, are commonly suicidal, and may be inflicted with any variety of cutting instrument. The hemorrhage from these wounds is usually abundant, notwithstanding none of the larger trunks are divided; the blood flowing freely from the venous plexuses and the thyroid body. If the larger arteries, as the carotid and its primary branches, be divided, the hemorrhage may be so profuse as to cause almost instantaneous death. Another source of danger arises from the admission of air into the veins, which may occur in consequence of a very small wound. The large nerves, as the phrenic and vagus, cannot, in a suicidal wound, be divided without injuring the neighboring vessels. The division, however, of the respiratory nerves, or even of one of them, would undoubtedly prove fatal by the interference of the respiratory act which would thus be occasioned.

The *air passages* are commonly wounded in the more serious suicidal attempts. They may be known by the air being seen and heard to bubble in and out of the wound during respiration. They are frequently complicated with injuries of the larger

vessels and nerves, and sometimes with wounds of the œsophagus. Owing to the generally received impression that making an opening into the trachea produces immediate death, the incision is commonly made high in the neck where it is the most easily reached; hence, the more important vessels are, through a want of knowledge of the parts, avoided, and the bravado of the victim unrewarded by success.

There are four situations in which these wounds occur:

1st. *Above the hyoid bone*, the cut extending into the mouth and wounding the root of the tongue. Such a wound is attended by copious hemorrhage; there is much difficulty in feeding the patient, as the power of swallowing is completely lost.

2nd. In *the thyro-hyoid space*, laying the pharynx open, but not affecting the larynx, being entirely above it. This is the most common situation of suicidal attempts. In these cases there is great danger of the supervention of œdema glottidis, and consequent suffocation.

3rd. *The larynx* may be cut through, either transversely or longitudinally. In these cases there is much danger to be apprehended from a trickling of the blood into the air-passages, and asphyxiating the patient, and from inflammation of the bronchi and lungs supervening at a later period.

4th. *The trachea* may be wounded, in which event the same dangers are attendant that are observed in wounds of the larynx.

The principal causes of death, however, in wounds of the air-passages, are seen in the occurrence of bronchitis and pneumonia, either from the inflammation extending downward from the wound, or in consequence of the cold air entering the lungs directly, without being warmed by passing through the nasal cavities.

The depressed mental condition of the patient is also unfavorable to recovery in those instances in which the wound is suicidal, disposing him to low forms of inflammation.

Treatment.—The same general principles are applicable here as in wounds of other regions.* The hemorrhage is of course the first thing to be attended to, by the ligature of all bleeding

*See Incised Wounds, vol. 1, page 635.

vessels, whether arterial or venous, in order to prevent an engorgement of the air-passages. In severe cases it will be found useful to introduce a large silver tube into an aperture in the trachea, for the patient to breathe through, and then plugging the wound around it. So soon as the bleeding has fairly ceased, the tube and plugs must be removed.

The edges are next to be approximated, by the use of a few sutures, leaving a small opening in the center of the cut, thus anticipating the formation of coagula in the deeper parts of the wound, which, unless removed, would be likely to occasion suffocation. An exception to the rule of leaving a central opening occurs in cases in which the trachea has been completely cut across. Here a stitch or two on each side of the tube is required, to prevent the wide separation of the two portions that would otherwise take place, owing to the great mobility of the larynx and upper end of the windpipe.

Proper attention must then be given to the position of the head, which is to be placed so as not to induce tension in the vicinity of the wound, and retained thus by an application of the uniting bandage, described in vol. 1, page 115.

Union by first intention is rarely obtained; and, indeed, the closest attention is often required to produce union at all, as the food may pass into the larynx and make its appearance at the external opening, even though neither the pharynx or œsophagus have been wounded; and hence extreme irritation is the result. This condition of things occurs in consequence of the loss of the natural sensibility of the glottis, in view of which it no longer contracts on the application of a stimulus, such as the presence of food taken in by the mouth ordinarily affords. In these cases it will be necessary to introduce food by using the stomach-tube. In the event of failing to procure union of wounds involving the larynx or trachea, a laryngeal or tracheal fistula results, together with loss of voice; though, when the opening is temporarily closed as with the finger, the patient is sometimes enabled to speak. These fistulæ, though not a little intractable, can be closed by repeated cauterization with nitrate of silver, or by a plastic operation, which consists in freely paring the edges of the orifice, and passing the knife under them for some distance, so as to detach

them from subjacent parts; a vertical incision is then made through the lower lip of the opening—so as to split it downwards. Two points of suture are now to be inserted into each side of the horizontal incision, bringing their edges in contact, *but the vertical cut is left free* for discharges and saliva to drain through. Unless this outlet be afforded, these fluids will soon produce so much tension that the sutures will cut through the tissue.

SECTION V.

WOUNDS OF THE CHEST.

Non-penetrating wounds of the chest have no characteristics by which they are particularly distinguished from similar lesions in other parts of the body except those which are due to anatomical relations and the mechanical action of the chest. In view of the disturbing influence of the respiratory movements, it is important in facilitating union of the edges of any superficial wound of the chest, that the sutures and adhesive strips be applied with skill and carefully watched.

Contused wounds of this region are liable to be followed by inflammation of the thoracic contents, in consequence of the concussion which these parts would unavoidably undergo. In such cases the treatment will be the same as heretofore pointed out under the head of "Contused Wounds," vol. 1, p. 644.

Wounds of the Lung may be regarded as serious, in proportion to the amount of air admitted, or from the hemorrhage, or from the grade of the inflammation following. Wounds of this organ may occur, without any external opening, as from the ends of a broken rib being driven inwards; most frequently, however, the accident is due to a penetrating wound inflicted by a pointed instrument or by a bullet.

Symptoms.—If the wound be severe the patient will manifest the usual signs of shock, being seized at the same time with difficulty of breathing, followed by much tickling and irritating cough, with expectoration of frothy, bloody mucus, or perhaps of large quantities of pure blood. The air may also pass in and out during respiration, and emphysema, pneumo-thorax, or pneu-

monia, will speedily supervene; and in case the thoracic opening should exceed in extent the orifice of larynx, there will be complete collapse of the lung. On auscultating the chest immediately after the infliction of the injury, and before there is any time for the supervention of any after-consequences, a loud, rough crepitation will be distinctly audible at and around the seat of injury.

The principal dangers resulting from a wound of the lung are hemorrhage, both external and internal; emphysema, pneumothorax, pneumonia, and empyema.

The *hemorrhage* is usually abundant and often fatal; the patient spitting up a large quantity of florid, frothy blood. If it do not prove fatal in the early period of the injury, the expectoration generally ceases in a great measure in the course of forty-eight hours, being followed by sputa of a more rusty character. If the external wound be free, there will be copious bleeding from it, but not infrequently the blood finds its way into the plural sac, rather than through the external opening, and may produce death from the quantity effused, or by occasioning suffocation. The symptoms of this concealed hemorrhage (*hemothorax*) are the same as those characterizing the loss of blood from other parts, such as coldness and pallor of the surface, small weak pulse, a tendency to collapse, with increasing dyspnœa. The more special signs consist in an inability to lie on the *uninjured side*, with, in some cases, some bulging of the intercostal spaces, and an ecchymosed condition of the posterior part of the wounded portion of the chest. Still more important signs, however, are furnished by auscultation. As the blood gravitates towards the back of the chest, between the posterior wall and the diaphragm, there will be gradually increasing dullness on percussion in this situation, with absence of respiratory murmur; the other portions of the lung admitting air freely.

Emphysema, the infiltration of air into the cellular tissue of the body, and *pneumo-thorax*, an accumulation of air in the cavity of the pleura, are not infrequent complications of a wounded lung. These accidents more commonly occur when the external wound is small and oblique, and they may happen in cases in which the lung is punctured by a fractured rib, without there

being an external wound. In the majority of cases emphysema and pneumo-thorax occur together, but either may be met with separately. The mechanism of traumatic emphysema is commonly as follows:

If the pleura costalis be wounded and the lung injured, at every inspiration a quantity of air is sucked into the pleural sac, either through the external wound, or, if none exist, from a hole in the lung, thus giving rise to pneumo-thorax. At every expiration, the air thus accumulated in the pleural sac, being compressed by the descent of the walls of the chest, is pumped into the cellular tissue around the edges of the wound; and if this be oblique and valvular, being unable to escape wholly through it, finds its way at each succeeding respiration further into the large cellular planes, first about the trunk and neck, and eventually, perhaps, into those of the body generally. Though this is the way in which emphysema usually occurs, it may be occasioned otherwise, as by the rupture of an air-cell or bronchus without any external wound. The air, getting into the posterior mediastinum, and, finding its way along the nerves and vessels in this situation, passes through the cervical fascia, which closes the upper part of the thorax, and thus reaching the neck, diffuses itself along the sheaths of the arteries and nerves, along which it finds its way into the limbs; its appearance being first noticed by its extending along the course of the vessels.

The *symptoms of emphysema* are distinctly marked. There is a puffy swelling, pale, and crackling when pressed upon, at first confined to the neighborhood of the wound, if there be one externally; if not, making its appearance opposite the fractured ribs, and gradually extending over the upper part of the trunk and neck, to which it is usually limited. Rare cases occur, however, in which the swelling becomes more general, the body being blown up to an enormous size, the features effaced, the movements of the limbs interfered with, respiration arrested, and suffocation consequently induced; after death air has been found in all the tissues, even under the serous coverings of the abdominal organs.

In *traumatic pneumo-thorax* there is diminution or complete absence of the respiratory murmur on the affected side, with a

loud tympanitic resonance on percussion, puerile respiration in the sound lung, and considerable distress in breathing.

Pneumonia is an invariable sequence of a wounded lung, and constitutes one of the great secondary dangers of these injuries; the inflammation that is necessary for the repair of the wound in this organ having frequently a tendency to extend beyond the part injured, and not uncommonly to terminate in abscess.

Traumatic pneumonia resembles in all its symptoms, auscultatory as well as general, the idiopathic form of the disease. There is the same crepitation, dullness on percussion, and absence of the respiratory murmur as the process of hepatization advances, with rusty sputa, much tinged with blood, in the early stages. It differs, however, from the idiopathic form of the disease, in having a much less marked tendency to diffuse itself throughout the lung, in being limited to the injured side alone, and in more frequently terminating in abscess, which however is often dependent on the lodgment of some foreign body, as clots of blood, wadding or clothing, in the substance of the organ.

Empyema, a collection of pus in the chest, is usually occasioned at a later period by the irritation of effused blood, or of some extraneous substance that has lodged in the pleura. Its existence may be recognized by dullness on percussion, and absence of respiratory murmur in the posterior and lower parts of the chest up to a level that has a gradual tendency to ascend, and that varies according as the patient is upright or recumbent, until at last the whole side of the chest being filled with pus, there is increase of its size on measurement, with bulging of the intercostal spaces, and compression of the lung against the spine.

The *prognosis* in wounds of the lung is exceedingly unfavorable, but still is less so than similar injuries of most of the viscera. Gun-shot wounds of the chest are more dangerous than stabs, owing partly to the laceration attendant on a bullet wound, but chiefly to the lodgment of foreign matter.

Emphysema is seldom a dangerous complication, though it may become so, if very extensive, and allowed to increase unchecked. If both lungs are wounded at the same time, the result is almost inevitably fatal, either by the abundant hemorrhage suffocating or exhausting the patient; or in consequence of asphyxia occasioned

by air being drawn into both the pleural sacs, and by compressing the lungs, arresting respiration. This, however, does not necessarily result.

Treatment.—The treatment of wounds implicating the lungs must have reference to the various sources of danger that have been enumerated, and will be constitutional and local. In the *local* treatment of *penetrating* wounds of the chest, the weight of surgical authority is in favor of immediate closure of the wound so soon as all foreign bodies have been removed and the external hemorrhage controlled. Ligature of an artery is to be accomplished in the usual way, enlarging the wound, if necessary, in order to reach it. In the removal of foreign bodies, time and delicacy are requisite to prevent the exciting of, perhaps, even more irritation than would be occasioned by the continued presence of the foreign body itself, and light water dressings medicated with *Hypericum*, *Ledum*, or *Staphysagria*, should be continuously applied.

If the wound be a punctured one, *Ledum* becomes the appropriate remedy for external dressing, after the edges have been closed by means of sutures, plaster and *Collodion*. By this means the bleeding will be arrested, and the patient enabled to breathe with more facility. Hemorrhage from the intercostal arteries is seldom troublesome. Should bleeding occur, however, from these vessels, the orifice of the wound must be enlarged, and the bleeding vessel secured in the ordinary way.

Wounds of the internal mammary are of rare occurrence. The danger is increased in such cases, however, by the extravasation of blood into the anterior mediastinum, or one of the pleuræ, without any external hemorrhage revealing the mischief going on within. If division of the artery takes place, the vessel must be sought for and tied at *both ends*. If much blood has been already extravasated within, it may be removed through the external orifice by means of a female catheter, or by the application of a cupping-glass over it, and the case then treated like one of effusion into the chest. It may be necessary, at any time after the application of the first dressing, to reopen a point of the wound to permit the escape of fluids contained within the cavity of the chest, the presence of which will usually be indicated by tension

and a swollen appearance of the wound, with dyspnœa. During the entire treatment of the case, perfect rest and freedom from excitement must be enjoined.

The *constitutional* treatment consists in equalizing the circulation by the administration of *Aconite*, which arrests the hemorrhage, by diminishing the quantity of blood circulating through the lungs. If evidences of shock are present, or contusion have been added to the injury, *Arnica* is specially indicated. The abstraction of blood generally, as advised by allopathic authority, is productive of more harm than good, by lessening the volume of the circulating fluid, depressing the vital powers, and predisposing to complications which otherwise would not occur. The dangers apprehended by allopathic surgeons of consecutive inflammation within the chest, I believe to be almost entirely due to the use of the lancet in the *earlier stages of the injury*. It is a principle, immutable as the law of gravitation, that after every "free venesection" a corresponding degree of vascular excitement takes place, the excitement being in a ratio corresponding to the quantity of blood abstracted; hence the existence, after such injudicious treatment, of *subsequent inflammation*, upon which so much stress is laid by allopathic writers. It has been made the occasion of remark by military surgeons, and my own observation strengthens the fact, that, in all chest wounds following an engagement, those who were overlooked and brought into the military hospitals two or three days after the infliction of the injury always did better, ceteris paribus, than those who were placed under this heroic treatment immediately after the injury received. The process of sealing* "hermetically" penetrating gun-shot wounds of the chest, which was introduced into practice during the war of the rebellion, did not long survive its introduction. The published records of cases treated by this process are a sufficient evidence of the inutility of the practice. The great sheet-anchors of hope in these cases are *Aconite*, *Belladonna*, *Crocus*, *China*, *Calendula*, *Ferrum*, *Hypericum*, *Hamamelis*, *Ipecac*, *Secale*, *Sabina*, *Sulphur* and *Veratrum vir.*, as recommended under the head of Gun-shot Wounds, vol. 1, page 687.

* Vide Gun-shot Wounds of the Chest, vol. 1, page 702.

If extravasation of blood into the pleura is going on, it must be arrested upon the same principles heretofore laid down in External Hemorrhage, vol. 1, page 158. After arrest of internal hemorrhage, the blood contained within must be early let out from the pleural sac; if permitted to remain, putrefaction and formations of pus will be the inevitable result. To prevent such an unfavorable circumstance, the wound should be opened from time to time, and the discharges removed.

In cases of purulent effusion into the chest, tapping should be resorted to *early*, in order to prevent the serious consequences that ensue from such a condition.

Extraneous bodies penetrating the chest and remaining unextracted, frequently form around them abscesses, by which means they are loosened, and either split up or forced to the external wound, while in other instances they remain in the chest permanently fixed for years, without producing any constitutional or other irritation. An example of this kind is given by Hennan, where a bullet was lodged in the chest for upwards of twenty years; and Vidal mentions a case where the broken end of a foil lodged in the chest for fifteen years, which after death was found stretching across to one of the ribs, with one point sticking in the vertebral column.

Emphysema seldom requires any additional treatment to that which has been spoken of already in wounds of the lung. In most cases, the air becomes rapidly absorbed during the treatment appropriate to the case. In others, again, the firm and equally adjusted bandage will be beneficial. If, however, the emphysema be so extensive as to interfere with respiration, the external wound must be freely opened, and the cellular tissue scarified so as to give ready exit to the incarcerated air.

SECTION VI.

HERNIA OF THE LUNG, OR PNEUMOCELE.

This extremely rare affection consists in the protrusion of a portion of the lung so as to form a tumor, and may supervene on chest wounds after the cicatrix has formed, or may be present

from the first. It has been known to occur from fractured ribs, and even from violent straining during labor. This protrusion may take place at any part of the thoracic parietes, though it most frequently occurs on the side of the chest.

The affection approaching this in character, for which it might be mistaken, is a circumscribed empyema. The diagnosis, however, may be readily made by observing the dullness of percussion, the absence of respiratory murmur, and of crackling under the fingers, which are peculiar to the latter.

Careful manipulation and well-adjusted pressure, together with closure of the wound, will usually suffice to overcome the difficulty. Otherwise it will be preferable to allow the exposed portion to become gangrenous and slough off rather than to excise it, or employ a ligature. Either plan may be followed by free hemorrhage.

Thoracic fistulæ are generally the result of some foreign substance remaining in the wound, and frequently supervene on gun-shot wounds. Efforts should be made to remove the cause of irritation, after which the fistula will be likely to heal readily by making an application of caustic. Provided the patient has become exhausted and emaciated in consequence of the discharge, it will be necessary to support the vital energies by the use of a nourishing diet, together with the administration of *China*, *Arsenicum*, etc.; stimulants may also be appropriate in certain cases. Under some circumstances a plastic operation may be advantageously performed for a final cure of the case.

SECTION VII.

WOUNDS OF THE HEART AND LARGE VESSELS.

Wounds of the heart do not necessarily prove immediately fatal, as appears from various cases reported in which patients have survived many hours, weeks and even months. And, indeed, cases are recorded in which, upon post-mortem inspection, cicatrices were found in the walls of the heart, having received the

wound years before.* Generally, however, immediate death occurs from the sudden loss of blood and the nervous depression which the patient sustains.

It appears that the rapidity with which the wound proves fatal depends greatly on its direction and the part of the organ injured. When the wound is parallel to the axis of the heart, it is not so speedily fatal as when in a transverse direction, and wounds of the auricle are more dangerous than those of the ventricle, the irregular contraction of the different planes of the muscular fibres that enter into the formation of the wall of the ventricle tending to obstruct the free passage of the blood through the wound. The size of the wound, however, will necessarily influence the result more than its direction.

Symptoms.—The symptoms are those of prostration, syncope, a feeble and irregular pulse, labored respiration, and extreme anxiety of countenance. Abnormal sounds, as the occurrence of friction, with absence of impulses, will also be perceptible by auscultation. Later there will be more or less inflammation of the pericardium, in consequence of which a serous effusion will occur, producing dullness on percussion.

Wounds of the large vessels, as the *aorta*, *venacava*, *pulmonary artery* and *veins* are usually fatal upon reception of the injury.

Treatment.—The effects of the shock are to be removed as speedily as possible by the usual means, preventing as much as possible the supervention of inflammation, which will have a tendency to extend to the pleura and lungs. Provided extensive effu-

---

*In the New York Journal of Medicine, May, 1855, S. S. Purple refers to forty-two cases of wounds of the heart, several living for hours afterwards. Bill Poole, the pugilist, survived until the ninth day, a ball lying imbedded between the ventricles. Davis and Steward found a piece of wood three inches long in the right ventricle of a boy who lived five weeks after the accident; and Latour relates a case of a soldier who received a wound in the right ventricle, the ball lodging against the septum for six years without producing death. Olivier and Sauson have also collected twenty-nine cases of penetrating wounds of the heart which did not prove fatal until forty-eight hours after the injury. Mr. Farras also relates the case of a man who lived for twenty days with a skewer transfixing the heart from side to side.

sion should take place into the cavity of the pericardium or of the pleura, the wound should be opened for the discharge of the fluid, or we may have recourse to paricentesis thoracis, or pericardii.

Wounds of the large vessels are to be treated on the general principles already given, there being nothing peculiar in their management. Dr. Heil records a case in which a patient so far recovered as to have lived twelve months after receiving a stab that penetrated the ascending aorta.

SECTION VIII.

INJURIES OF THE ABDOMEN.

Injuries of the abdomen may be studied, 1st. As *contusions* with or without rupture of internal organs. 2nd. As non-penetrating wounds. 3rd. As penetrating wounds.

Contusions of the abdomen, resulting from blows, kicks, falls, and the like, may terminate favorably without the occurrence of any complications. They are particularly liable, however, to be followed by internal injury, violent concussion or rupture of some of the viscera. In military practice, what seems a simple contusion of the parietes resulting from a gun-shot injury, may be followed by death in consequence of a tearing of the liver, spleen, kidney, stomach, or bladder, all being followed by more or less concealed hemorrhage, symptoms of collapse, and later by peritonitis.* In civil practice they result from blows, railroad concussions, or by the body being compressed by the wheels of a heavily-loaded vehicle, each being accompanied by symptoms of urgent collapse. The viscus most likely to be injured in this manner is the liver, owing to its size and the tender character of its tissue. The stomach, also, is very liable to the same result, provided it be distended by a meal at the time of accident. Any portion too, of the intestinal canal may be lacerated, the mesentery torn, or the spermatic cord snapped asunder. Peritonitis is a most dangerous complication and is particularly apt to ensue,

* See Gun-shot Wounds from Cannon-balls, vol. 1, page 677.

provided the patient survive the more immediate effects of shock and hemorrhage. Injuries of the parietes of the abdomen, if followed by inflammation and suppuration, frequently result in sinuses and fistulæ from the burrowing of pus beneath the aponuroses of the muscles, opening more frequently externally than into the peritoneal cavity.

Symptoms.—The symptoms of internal abdominal injury are not always well marked. In case, however, the accident be followed by evidence of severe shock, anxiety of countenance, coldness and pallor of surface, pulse feeble, intense pain at seat of injury, with dullness on percussion owing to the presence of extravasated blood, the case may be regarded as hopeless.

Rupture of the stomach is commonly indicated by the vomiting of its contents mixed with blood. Rupture of the intestines, by the admixture of blood with the stools.

Laceration of the kidneys or bladder, will often be shown by the emission of bloody urine, and a frequent desire to pass water; though absence of blood in the urine is not always a sure indication that the kidney has escaped injury, as it may be so disorganized as to be incapable of performing its functions, and hence no urine finds its way into the bladder.

Emphysema of the abdominal wall gives rise to signs observed in the thoracic form of this effusion, such as the same doughy, puffy feel, and a crepitating swelling of the cellular tissue, and may result from the escape of flatus from a wounded intestine. It commonly makes its appearance in the flank, and forms a valuable diagnostic sign to determine whether the intestine has been wounded.

The diagnosis of abdominal emphysema from the thoracic variety, is readily made by observing the situation of the injury, and by the puffiness and crepitation occurring in the posterior and lateral walls of the abdomen, or in the immediate vicinity of the wound.

Putrefactive emphysema may be known by its cause, and by the presence of a low grade of inflammation of the cellular tissue.

2nd. *Non-penetrating wounds of the abdomen* are those which do not open into the peritoneal cavity and are rarely of a

serious character. Provided, they require the application of sutures, care must be taken not to introduce them through muscular or tendinous structures, but simply through the skin. The patient is to be placed in such a position as to relax the abdominal walls, thus facilitating union as well as promoting the comfort of the individual, and treating the case as simple incised wounds.

3rd. *Penetrating wounds of the abdomen*, those opening into the sac of the peritoneum, are important in view of their liability to be followed by peritonitis and injury of the viscera. For convenience they may be divided into those which do not involve any of the contained organs, and those complicated with a protrusion or wound of some of the viscera.

The first class, or those without visceral protrusion or injury, may sometimes be distinguished from simple wounds of this part by the escape of a small quantity of reddish serum.

The examination instituted, in order to arrive at a correct diagnosis, should be conducted with care, that the irritation of the wound may not be increased more than is absolutely necessary; and in the absence of significant signs of their communicating with the cavity of the peritoneum, they should be treated as a simple wound, meeting the subsequent complications which may arise in the manner to be described.

The second class, or those accompanied by a protrusion or wound of the viscera, are fatal according to the part injured; for as stated by Macleod,* balls entering the liver, kidneys or spleen, are almost invariably followed by death. Wounds of the small intestines are also formidable, even more so than injuries implicating the large bowel.

Protrusion of the intestine, mesentery or omentum, may take place through the opening in the abdominal wall, in such a manner as to be reducible, or from constriction become irreducible.

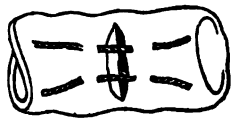
Protrusion of Intestine, occurring through the abdominal parietes, is an accident often requiring skill and patience in its treatment, as the protruded mass is always of large size compared with the aperture through which it escapes, and having a tendency

* Surgery Crimean War, p. 227.

to become constricted. No incision, however, should be made for the purpose of enlarging the opening in order to facilitate the restoration of the viscus, until effort has been made to replace it by manual means, aided by anæsthetics. The manipulation should be conducted as follows: Place the patient in such a position as to produce the most perfect relaxation of the abdominal muscles, which will be effected by elevating the shoulders and drawing the knees towards the chest; anæsthesia is then to be produced as previously directed, and the protruded mass thoroughly cleansed by squeezing tepid water upon it; after oiling the fingers, seize the viscus and gently replace it, allowing it to remain in the immediate neighborhood of the wound, never pushing the finger into the cavity of the abdomen. The part may be inflamed, dark red, or even black, with its temperature much reduced, yet, if it be not actually gangrenous, should be promptly returned. If, however, gangrene has occurred from constriction and continued exposure, no attempt at reduction is to be made, but the gangrenous portion should be excised, the divided ends brought together and secured by a clamp, as will be more particularly described under the head of strangulated gangrenous hernia; or else an incision should be made through the gut to permit the escape of fæces, and the formation of an artificial anus. If the omentum be gangrenous, it is to be excised on a level with the peritoneum, after which the portion lying within the abdomen will contract adhesions to its wall.

Special attention is to be accorded to those cases in which there is a wound of the protruded intestine; the line of practice, however, to be pursued, has been a point of some difference of opinion, though surgeons of the present day advise the use of sutures in preference to returning the gut, so as to form an artificial anus. Much care is required in the application of the stitches; they should be introduced by means of a fine round needle, armed with sewing silk, bringing the peritoneal surfaces of the intestine in apposition, thus folding the edges of the wound inward. The safer plan is also to carry the suture through the entire thickness of the gut, bringing the needle out at about one-sixth of an inch from the edge of the wound.

Fig. 247.



The kind of suture that should be employed is the interrupted or "Lambert" suture. The ends of the threads should then be cut close to the knot, as leaving the ends of the thread hanging from the aperture produces great irritation, acting like a seton. Inflammation being developed by the stitches, fibrin is effused, covering them in, and gluing together the subjacent peritoneal surfaces, whilst the thread eventually ulcerating through the muscular and mucous coats will be discharged per anum.

Provided, however, the wound of the intestine be a puncture, Travers has recommended that the wounded portion be picked up and ligatured by means of a fine thread, which soon becomes imbedded by the effused fibrin, the ligature subsequently ulcerating through the coats to be discharged with the fæces.

After the opening in the gut has been closed by suture or by ligature, as the case may be, the protruded portion is to be washed with tepid water, and returned in the manner described, the surgeon being especially careful not to push the injured coil far into the abdomen, but leave it close to the external orifice, so that in the event of extravasation or the stitches giving away, a ready outlet may be afforded. Should the wound in the abdomen be extensive, it is to be closed by the use of sutures and adhesive strips, supported by a bandage or by long, broad strips of plaster.

The *after-treatment* must be conducted in all respects on the same principles that guide us in the management of an intestine that has been wounded without protruding. The position of the patient should be easy, the bowel near the external opening be kept quiet as possible. The urine should be drawn off two or three times a day, and the peristaltic action of the intestines be kept free from excitation, for fear of breaking up adhesive action going on in the wound. The simplest kind of food should be given, and in the smallest quantity for the first three days; after this time, beef tea and light food may be taken more freely. After the seventh or eighth day, if any inconvenience arises from constipation, an enema of oil or warm water may be given and repeated from time to time.

The great danger to be apprehended in all these injuries of the

bdomen is *traumatic peritonitis*, attended by the exudation of rbid serum, and shreddy ill-conditioned lymph, that is so speedy fatal. It is ushered in with uniform tenderness of the abdoen, tympanitis, especially in the vicinity of the injury, lancating pains, a small, quick, wiry pulse, vomiting, hiccup, with onsiderable pyrexia and anxiety of countenance. As inflammaon increases, dullness on percussion ensues, beginning first on ie flanks and gradually extending until it involves nearly the hole surface of the abdomen. In the treatment of this disease ie character of the inflammation will be the guide for the selecon of remedies. If it possesses a sthenic type, and the patient e young and robust, *Aconite* should be administered internally, nd fomentations of the same remedy be applied freely over the rface of the abdomen. The most rigid diet should be enforced, nd the patient kept perfectly quiet and free from excitement. he remedies of most value in the treatment of this affection are: *lconite*, *Apis*, *Arsenic*, *Belladonna*, *Bryonia*, *Cantharides*, *achesis*, *Mercurius*, *Natrum*, *Opium*, *Rhus tox.*, *Sulhur* and *Veratrum*, according to their indications.

Aconite—for hot, dry skin, quick and hard pulse, inflammaory fever, tongue and mouth dry, great thirst, bitter taste, vomiing, constipation, scanty red and hot urine, restlessness, cutting, arting pains in the bowels, increased by pressure and lying on ie right side, with great heat of the abdomen.

Apis—burning, stinging pain in the bowels, very sore to the ouch, after exudation has taken place; with swelling of the bdomen and feet, with dark, scanty urine, vomiting of bile, iarrhœa, fullness and distention of the abdomen, great sensitiveess to touch.

Arsenic—later in the disease, with sudden sinking of strength, old clammy perspiration, continued thirst with drinking small uantities at a time; burning in the abdomen, incessant vomitng; hard, bloated abdomen; thin, watery stools; the symptoms ecoming worse in the middle of the night.

Belladonna—congestion to the head; intolerance of light and oise; colicky pains in the bowels; painful retchings and vomitng; pains increased by motion and contact; great anxiety; painully distended stomach; flatulence, ameliorated by pressure; titches in the left side of the abdomen when coughing.

Bryonia—stitching, pressing, lancinating pains in the abdomen, increased on the slightest motion, after exudation has taken place; tongue white and dry; great thirst, and drinking large quantities at a time; bowels constipated; nausea and retching; relief after eating; indisposition to move at all.

Cantharides—burning, hot abdomen; tympanitis; bloody slimy stools; painful and extorting cries; tenemus of the bladder; strangury; anguish and restlessness; sunken features, distressed face and cold extremities; chilliness and tenemus after stool.

Lachesis—abdomen hot and sensitive to touch; nausea and vomiting; great thirst; great discomfort from the weight of bedclothes; decubitus on the back, with knees drawn up; scanty, turbid urine; constipation; desire for wine.

Mercurius—at a later period, with creeping chills, perspiration without relief; pale countenance; unpleasant fetor from the mouth; vomiting of slime; slimy stools, with straining; swelling of the abdomen and feet; weakness of digestion, with hunger; symptoms worse at night; sense of emptiness in the abdomen; pain in region of the liver.

Rhus tox.—great restlessness; tongue red at the tip; continual change of position; pressing, cutting pain in the bowels; typhoid symptoms.

Sulphur—when the disease is protracted and does not seem to be affected by remedies.

Veratrum—vomiting and diarrhœa after the least food; coolness of the skin; sunken features; great thirst; weak, small pulse; restlessness and anxiety; cutting in the abdomen, as with knives; bowels hard and bloated; voracious appetite; unquenchable thirst; cold sensation in the mouth.

SECTION IX.

INJURIES OF THE PELVIS.

Wounds of the Bladder occurring in the portions invested by peritoneum are dangerous from the supervention of general peritonitis. Rupture of this organ may also occur from very

ght degrees of violence, especially if it be distended at the
ie of accident, as running against a post, falling from a bed,
from blows otherwise produced. An opening being made in
y part of the viscus not covered by peritoneum, the urine will
ltrate into the cellular tissue between this membrane and the
dominal wall, and diffusing itself widely, produce sloughing of
tissue with which it comes in contact. In these cases the
ient commonly sinks from the combined irritative and inflam-
tory action.

Most of the wounds, however, implicating the bladder, happen
m gun-shot violence, and though of an exceedingly grave
aracter, are not to be regarded as hopeless.

The **symptoms** of ruptured bladder are sufficiently evident
injury in the hypogastric region, followed by collapse, by
ense burning pain in the abdomen and pelvis, with inability
pass the urine, or if any escape, its being tinged with blood,
ll indicate the nature of the affection.

In addition, it may be found, upon introducing a catheter,
at the organ is empty, or that only a small quantity of bloody
ine escapes; indications which render it quite certain that rup-
re has been produced. In the case of gun-shot wound, the
ine generally follows the track of the bullet, and will afford
sitive evidence of the mischief that has been produced.

In the treatment of a wounded bladder, *two* prominent indica-
ns are presented. First, to prevent extravasation of urine;
cond, to guard against undue inflammation. The bladder should
evacuated immediately, by the introduction of a gum-elastic
theter, the patient occupying a semi-erect position in bed, and
retained permanently, to enable the urine to pass away as fast
it collects in the bladder. Care should be exercised that the
d of the catheter does not irritate the mucous membrane of the
adder, thereby exciting pain and spasms, rendering the patient
ceedingly uncomfortable. If any sign of extravasation makes
appearance, free and deep incisions should be made, so as to
cilitate the escape of effused fluids and the putrid sloughs.

If the injury has been produced by firearms, and the foreign
dy has fallen into the bladder, there can be nothing gained by
attempt to extract it. If severe symptoms follow its presence

there, attempts must be made to remove it by the forceps, or failing in this, the operation of lithotomy should be performed.

When the bladder has been transfixed, or wounded through the peritoneum, the accident inevitably proves fatal, in consequence of extravasated fluids. In such a condition it has been recommended to make an incision through the linea alba and sponge out the discharges.

To prevent undue inflammation, *Aconite* should be administered, and the case subsequently treated as traumatic cystitis. *Arnica* or *Hypericum* lotions should be continuously applied to the wounded surface and the pain and spasms controlled by either of the following remedies: *Arsenicum*, *Belladonna*, *Berberis vulg.*, *Cantharides*, *Chimaphala*, *Lycopodium*, *Mercurius*, *Nux vomica*, *Pareira brava*, *Pulsatilla*, *Sepia* and *Sulphur*.

Arsenicum—violent burning in the bladder; vomiting and nausea; *restlessness;* cold perspiration; distension and paralysis of the bladder; turbid urine, mixed with pus and blood.

Belladonna after *Aconite*—rapid sinking of strength; region of bladder very sensitive to touch; hot and red urine; delirium; hard and quick pulse.

Cantharides—violent tenesmus and burning; vomiting and nausea; frequent small pulse; cutting through the abdomen; difficult and painful micturition; urine turbid, bloody and scanty; fever and restlessness; thirst, but drinking increases the pain; cramping pain in the thighs.

Mercurius—chilliness, with fever; great sensitiveness in region of the bladder; violent purging; discharge of mucus, pus and blood; sweat breaks forth during micturition.

Pareira brava—constant urging to urinate; violent pains in the region of the bladder; difficult micturition, with pressing and straining, and escape of a few drops only; strangury; urine thick, viscid, with white mucus; strong ammoniacal smell; pains in the thighs, shooting down to the feet; worse in the early morning.

Berberis vulg.—paralysis of the bladder, with discharge of great quantities of mucus; absence of ammoniacal smell; pains in the hip.

Uva ursi—frequent urging, with little discharge; burning, ting pain; urine bloody, with mucus.

The other remedies mentioned may be used according to cir- nstances, their pathogenetic indications being more precisely ined in the materia medicas.

During treatment the patient should drink very sparingly, the t should be light and bland, and he should be kept in as quiet tate as possible. If abscesses follow as the result of urinary iltration, they should be opened by early and free incisions.

Laceration of the Urethra occasionally happens as the ult of kicks, or falls from a hight, the patient striking astride some object and rupturing the urethra at the triangular liga- nt. In these cases there is great bruising, and sometimes und of the perineum, the patient being unable to pass water, e effort also accompanied by deep, burning pain, followed, rhaps, by a discharge of blood or a few drops of bloody urine. ie immediate result is usually extravasation of urine into the rineum, which, if not checked by proper treatment, rapidly sses forward through the scrotum upwards to the abdomen, ving rise to extensive sloughing of every portion of the cellular sue with which it comes in contact, and leading, perhaps, to e rapid destruction of the integuments of these parts, and the nsequent formation of extensive and deep abscess and ulcera- on. If the patient recover from this mischief, he will not be kely to be free from a fistulous opening in the perineum, and timately suffer from a very intractable form of stricture, which some cases may be completely impassable, in consequence of portion of the urethra being torn across and sloughing away.

Treatment.--Much of the immediate danger may be avoided y introducing a catheter in the bladder before an attempt has een made to void the urine, thus preventing urinary infiltration. any hardness, throbbing, or other sign of irritation occur in ie perineum, free incision should be made into the part, so as afford a ready outlet for any urine that may have been effused. the surgeon find it impossible to introduce a catheter into the ladder, the urethra being torn completely across, he should pass as far as it will go, and then putting the patient in the posi- on for lithotomy, make a free incision in the mesial line, upon

the point of the instrument, so as to make an opening into the perineum communicating with the deeper portion of the urethra; or, if the bladder be distended, a puncture may be made through the rectum. The after treatment must be conducted on the same general principles laid down in wounds of the bladder.

Laceration of the Perineum may result from mechanical injury, as falls astride a fence, upon legs of stools, etc., or, as in one case which occurred under the care of Dr. H. H. Smith, of Philadelphia, from the blow of the horn of a pet deer. In such cases the hemorrhage should be checked as promptly as possible, in order to prevent infiltration of blood into the surrounding tissues. The most common cause, however, is parturition, the rupture being the result of over-distension and consequent tearing of the muscles intervening between the verge of the anus and that of the vagina, weakening the normal support of the posterior wall of the vagina.

If the rupture be the result of parturition, there will be presented one of four varieties:

1st. Superficial rupture of the fourchette and perineum, not involving the sphincters;

2nd. Rupture to the sphincter ani;

3rd. Rupture through the sphincter ani;

4th. Rupture through the sphincter ani, and involving the recto-vaginal septum.

Prognosis.—In an incomplete case of slight character, in which neither the sphincter vaginae nor sphincter ani has been injured, no evil will probably result. The wound occurring immediately after labor, with more or less stretching and laceration of the fibres, is not likely to heal by first intention, but may unite by granulation, if the parts are closely kept in apposition by binding the thighs together.

This and the second variety named are trifling in their consequences, and frequently pass unnoticed by both patient and physician. The third is of much more serious import, and not disposed to undergo spontaneous cure, while the fourth represents the worst form of the condition.

The greater the injury, says Thomas,* "the less likely will be

* Diseases of Women, page 128.

spontaneous recovery, and the more probable the complications and results which have been mentioned." It may be affirmed in a general way, that any laceration which does not entirely sever the sphincter ani may heal without surgical treatment, and that none which converts the two passages into one will do so. Even when the rupture has been complete, it has been asserted spontaneous cure has taken place, but such reports need confirmation. Peu once affirmed that he had seen a woman thus injured, and who passed her fæces involuntarily, entirely recover. De la Motte declares that thirty years afterwards he met and examined Peu's patient, and found that no recovery had taken place.

Treatment.—If the patient be seen at the time of the injury, and the rupture be of the first or second variety, an effort should be made to secure union by thoroughly cleansing the wound of blood clots, bringing the thighs together, and keeping them in contact by a bandage placed above the knees. The patient should be placed upon her side, in such a position as to cause the lochial discharges to pass out at the superior vaginal commissure, and prevent its irritating the raw surface. The bowels should be kept constipated, the bladder emptied twice a day, and daily the patient should be placed upon her back and the vagina cautiously syringed with *Hypericum* lotion. If union occurs, it will take place in ten or twelve days; if not, it will be advisable to operate.

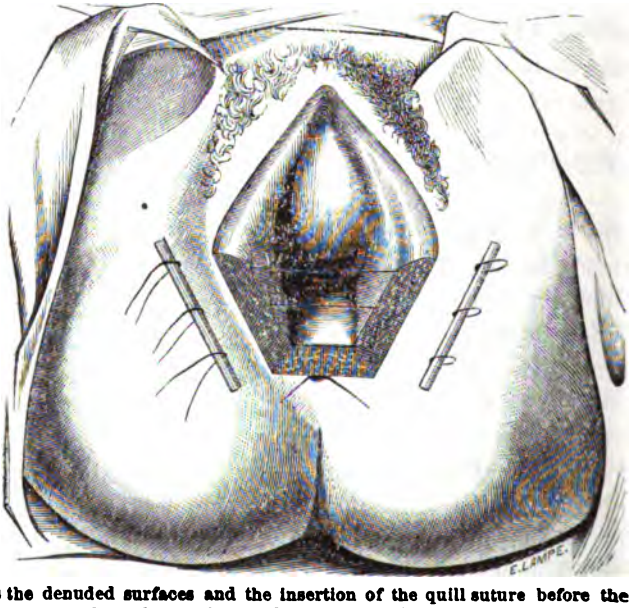
Time for Operation.—If the injury is discovered directly after the birth of the child, Scanzoni recommends that the operation should be done immediately after the delivery, as it is more likely that the bleeding lips of the wound will then unite without vivification of the edges, rendering the procedure simpler and less dangerous. If the injury is seen in the second stage, or when the lips of the wound have cicatrized, an operation becomes necessary to remedy the trouble.

Preparation of the Patient.—The general health should be at the highest standard, the bowels thoroughly evacuated the day previous to the operation, and the vagina well syringed with a weak solution of carbolic acid water, to remove secretions and quiet local irritation. The patient should be placed upon a table or bed, before a window admitting a strong light, placed in the

position for lithotomy, and gently brought under the influence of an anæsthetic. All being ready, the surgeon may select either Baker Brown's or Sims's operation, as he may prefer. My preference leads me to adopt the latter procedure, as the simplest and most efficacious.

Baker Brown's Operation.—"The instruments required are a scalpel, a blunt-pointed, straight bistoury, a pair of long dissecting forceps, three large needles, several small ones, a tenaculum, pieces of gum-elastic catheter to act as quills, common hemp twine waxed, and sponges. All being in readiness, an assistant holds the sides of the fissure so as to secure tension, and the operator, by means of a bistoury, removes all the cicatricial tissue, first from one edge and then from the other. This should be done so as not only to vivify all the cicatricial surface, but also the superficial layer of tissue above the cicatrix. After this, the external sphincter of the anus is divided, with the skin and areolar tissue lying over it. The muscle is cut on both sides,

Fig. 248.



Shows the denuded surfaces and the insertion of the quill suture before the parts are brought together, and also the division of the sphincter on each side of the coccyx.

bout a quarter of an inch in front of its attachment to the
coccygis, by two incisions, carried outwards and backwards, as
epresented in Fig. 248. For this purpose a blunt-pointed bis-
ury, guided by the finger, is carried up the rectum for an inch
nd a quarter, and by it an incision of an inch in length is made,
xtending outward from the anus, between the coccyx and tuber-
sity of the ischium. The thighs are then approximated and the
utures introduced. The left edge being grasped between the
humb and forefinger of the left hand, a strong needle, armed
ith a double thread, is inserted an inch external to the pared
rface, and passed downwards and inwards, so as to make its
oint come out at the bottom of the denuded surface. It is then
assed through the opposite lip, and brought out through the skin
t the same distance from the edge of the wound. This suture
passed at the upper angle. Another suture is then passed in
he same manner at the middle, which should go as deep as the
eptum, and even pass through it. A third suture is then passed
the lower angle. Two bits of gum-elastic catheter are now
laced, one on each side, the first within the loops of the suture,
he other at the opposite extremities. The sutures are then
ghtened, the opposing lips adjusted, and the sutures tied.
rom four to six silver sutures are then passed through the
dges of the skin, and the operation is complete."

Mr. Brown advises that before the patient is removed, the
dex finger of the right hand be passed into the rectum, and
at of the left into the vagina, in order to ascertain that
position is complete. The parts are then sponged and a
ld-water dressing applied and secured by a T bandage. The
tient is kept in bed upon unstimulating but nutritious diet, the
wels constipated, and the bladder frequently emptied by the
theter. The deep sutures should be removed in from three to
days, and on about the eighth day the superficial ones may
withdrawn. During convalescence, the vagina should be
inged out with *Staphysagria* lotion, or with a weak solution
carbolic acid, if offensive discharge exist. Constipation should
kept up for two or three weeks, and when alvine discharges do
cur, they should be encouraged and rendered easy by enemata.
ould a perineo-vaginal or rectal fistula remain, Mr. Brown
nks highly of the actual cautery in its cure.

In the use of the quilled suture after this plan, great care should be taken not to interfere with the vitality of the compressed parts, and in view of this they should be daily examined. A case has recently occurred in which, under the influence of too great constriction, although the operation was performed by one of the most skillful operators of this country, extensive sloughing ensued.

Sims's Operation.—The operation performed by Dr. Sims differs from that just described in many respects, most notably in silver sutures being employed, and no section to afford relaxation being practiced, either upon skin and areolar tissue, after Dieffenbach's plan, or upon the muscles of the part, after that of Horner, Copeland, Cooper and Baker Brown.

The first operator who treated these cases by metallic sutures was Mettauer, of Virginia, who, in the Edinburgh Medical and Surgical Journal, vol. 19, p. 552, described several cases successfully treated by lead used as an interrupted suture.

I avail myself of a description of Sims's operation, given by Dr. Emmet, and published in the New York Medical Journal, of December, 1865.

"In the operation for closing a lacerated perineum, either partially or entirely through the sphincter ani, it is unnecessary to divide the muscle, or to make incisions into the soft parts for the purpose of relieving tension.

As early as 1855, Dr. Sims, in the Woman's Hospital, simplified this operation by bringing the scarified edges of the laceration together by means of deep, interrupted silver sutures, and from this time the use of the quill suture, or a division of the sphincter ani, has been abandoned. Further experience demonstrated a necessity for the use of a short rectal tube for some ten or twelve days after the operation, that a free escape of flatus might be unobstructed. Where the laceration of the perineum has extended only to the sphincter, the rectal tube is not needed, and three interrupted sutures are generally sufficient; if more extensive, so as to involve the muscle, two in addition are required. The first suture passed should be the one nearest to the rectal mucous membrane, and should be made to follow the laceration entirely around, so as to bring together the sphincter. The second should also include the sphincter, and be passed in the recto-

al septum, just beyond the first one. The remaining sutures
troduced (as in the operation for a partial laceration of the
eum) through one labium about half an inch from the edge
e side, introduced from within outward into the other, and
rawn at a point equally distant, so as to approximate per-
opposite surfaces. If the laceration has extended up the
vaginal septum for some distance beyond the sphincter ani,
dges should be brought together down to the sphincter by
upted sutures, at a distance of about five sutures to the
On introducing the first suture to clear the perineum, care
be taken that it is passed between the first and second
s, uniting the septum, and the next one in turn between
cond and third. Without this precaution, an opening into
gina will be produced just behind the sphincter, from the
hat, as one set of sutures is passed at a right angle to the
on twisting those of the perineum, tension would be exerted.
s a weak point, for if the tube is allowed to become obstruc-
small recto-vaginal opening will always result from the
e of flatus in this direction. I always scarify by means of
rs; it can be done rapidly and without hemorrhage. The
should be kept tied together for ten days after the opera-
and the urine drawn with care, so that none is allowed to
e over the surfaces brought in apposition.
e sutures of the perineum are usually removed about the
day; those within the vagina must remain for two weeks or
r, until the parts are strong enough to admit of the intro-
n of a speculum. The bowels are to be kept constipated
o weeks, at least, in all cases where the sphincter is lacer-
When the bowels are to be acted on by either a purgative
rm mucilaginous injection, the success of the operation will
y depend on the dexterity of the nurse in properly support-
e parts."

his recent work upon vesico-vaginal fistula, Dr. Emmet
es that to avoid protrusion of the folded lips into the rectum
w employs a hollow, awl-shaped needle, with a handle. By
larger amount of tissue can be taken into the grasp of the
, and the operator is enabled to pass his wire thread simul-
usly through both lips, which secures more perfect adaptation.

For the purpose of preventing tension upon the sutures closing the perineal wound, Dr. T. G. Thomas has adopted a very simple procedure, which appears worthy of mention. Having entirely closed the wound, as has been just described, a long needle, armed with silk, is passed about an inch and a quarter from the edge of the wound downwards through the vaginal septum, and brought out at a corresponding point on the other side. By means of the silk, a silver wire, doubled, is drawn through, and the doubled extremity cut. Through the two eyes of an ivory button one inch in diameter, the extremities of the wires are now passed, and then twisted on both sides of the vulva and the twisted ends left long. Another such suture is passed above this one, which does not involve the septum. By these deep sutures, which, of course, are only a trifling modification of the quill suture, the parts are held at rest and traction upon the sutures prevented. When a swelling occurs, the wires may readily be untwisted, so as to accommodate it.

When the lower part of the rectal wall is involved as well as the perineum, it must be closed before the latter. This may be done by an entirely separate operation, performed a fortnight before the other, or the two openings may be closed at one time. The rectal opening should be closed by apposition of its edges, and approximation by silver sutures, placed a quarter of an inch apart.

It has been proposed, likewise, to cure these cases by applying to the cicatrical surfaces of the ruptured perineum escharotics, which, producing superficial sloughs, would leave granulating planes looking towards each other. These surfaces are then to be brought together by sutures, with the hope of producing more certain and powerful union. This procedure, so far as I am aware, has never been attempted; at least, there appears to have been no record of it; but I believe, in certain cases, it will be productive of good results, and if carefully done, will go far to simplify an operation, the result of which, in the hands of young surgeons is looked upon with some misgiving.

PART XIII.

AFFECTIONS OF THE BLOOD VESSELS.

CHAPTER I.

ANEURISM.

efinition.—The term *aneurism* is applied to a form of
or filled with blood and communicating with an artery,
ived of its integrity wholly, or in part. This tumor may be
ed either spontaneously by a dilatation of all the coats of the
el, as the result of diseased action in the tissue; or, by the
anical rupture of its internal and middle coats, with dilata-
of its external layer; or, by the rupture of all its coats and
formation of a tumor in the sheath of the vessel, or in the
ounding cellular tissue. Though reported as a common dis-
r in England, California, and New York, it is certainly quite
in Philadelphia, and equally so, I think, in the South and
ughout the great Mississippi valley and the West.

Varieties.—In the first place a distinction must be made
ween an *aneurism*, which consists of a dilatation of an artery,
part only of its circumference, and the *general* dilatation,
h consists of a bulbous expansion of all the arterial tunics in
whole of their circumference, and which differs from the true
urism in containing no laminated coagula. This distinction
nown by the terms *true* and *false* aneurisms. A *true aneu-*
n consists of a *sac* which is formed by the preternatural expan-
of one or more of the coats of an artery. This variety may
ır spontaneously, or be caused by wounds. *False aneurism*
ifies that the arterial coats are broken, either by a wound or
er external violence, or in consequence of disease, and the

blood escaping into the sheath of the vessel or into the surrounding connective tissue, forms an aneurismal sac; this condition is placed in the second class, and designated by the name of *false* or *diffused* aneurism. Aneurisms are again subdivided into *circumscribed true* and *diffused true*, and *circumscribed false* and *diffused false*, dependent upon the conditions existing in each. These subdivisions are, however, of little benefit in a practical point of view, the two generic terms of *true* and *false* answering all the purposes of the practitioner.

Dissecting.—There is another variety of aneurism beside those already described, termed the dissecting aneurism which, from its extreme rarity needs no extended consideration. In this variety of aneurism, the blood infiltrates the tissues between the arterial tunics, separating them more or less widely from each other and generally detaching the external from the middle internal tunics. More frequently, however, the transverse fibres of the middle coat are seperated into two layers, for a distance of several inches along the track of the vessel. Some of these tumors are of very slight extent and terminate in a blind sac; while others cut away the tissues and make a second aperture of communication with the artery, at the extremity of the hiatus, through which the stray current of blood again mingles with the main stream. This variety is principally confined to the aorta, and is rarely found affecting other arteries. It is a mere separation of the coats of an artery without any other symptoms indicative of aneurism.

Aneurism is also said to be *limited* or *diffused*. In the *first* variety, it is bound within the limits of a proper sac; in the *second*, the blood having burst through the sac, or wanting the sacciform capsule, is widely diffused by infiltration into the surrounding tissues.

Pathology.—Aneurism generally commences by a yielding of the internal and middle coats of an artery at the site of some atheromatous spot, after which the pressure of the blood dilates the external or cellular coat into a pouch. This mode of origin is evident from the distinct, rounded, circumscribed opening by which most aneurisms connect with the artery; it may also commence by a dilatation of all three of the tunics at some diseased spot. Sometimes the wound of the inner and middle coats

luced by a ligature has caused aneurism of the part tied. ietimes, again, as in a case that happened to Mr. Liston, an ry ulcerates and opens into a contiguous abscess, the sac of ch becomes the sac of the aneurism. Let the aneurism, how-, begin as it may, it gradually dilates under the constant pres- of the heart's impulse. It soon becomes lined with coagula, osited in distinct concentric laminæ, of which the outer ones the palest and firmest; and whether it was originally formed ll three tunics or not, certain it is, that the inner two soon te and disappear.

ymptoms.—There are certain symptoms which follow aneur-, wherever found, whether true or false, the first of which are to the action of the tumor itself. They are, changes of action, , and sensation in the part, or other adjacent parts. Most fre-ntly, simple inspection of the aneurism will show that it pulsates nctly, the elevation and depression of the surface consequent the pulsation being usually perceptible at some little distance. n examined by the touch, it also usually gives an elastic sen-n, and a pulsation that can be readily felt synchronously with ontraction of the heart, or has only such a variation as is con-ent upon the time which it takes for the impulse of the heart each the tumor. In diagnosing an aneurism, the surgeon will uided by the fact that there is an oval tumor on, or near the se of an artery, which is elastic and pulsates; the pulsation ppearing more or less perfectly by pressure on the main trunk e artery nearest the heart. Auscultation will also afford admir- aid in assisting to form a correct diagnosis; as upon putting ear upon the tumor, two varieties of sound will be heard—the *it de soufflet*, or bellows murmur, and the *bruit de rape*, or rasping or sawing sound; besides which the peculiar aneur- l thrill, or *whirr*, will be perceived, the latter being recog-ble by means of the touch.

he diagnosis between true and false aneurism is sometimes of rtance, especially in regard to the treatment. The history e case is also of great importance. Thus, if the patient states the tumor supervened upon violent muscular action, and rapidly med the aneurismal characteristics, the surgeon may fairly be o suspect a false aneurism; if, on the contrary, the tumor

appeared gradually, without any injury or violence done the part, and especially if the age of the patient is such as would lead one to suspect such diseases as calcareous or atheromatous degeneration, which act as predisposing causes, he might reasonably regard the disease as a true aneurism. In making the diagnosis, therefore, the history of the case becomes a matter of great importance. Aneurismal tumors vary in size in accordance with the calibre of the vessel; the dilatation of the anterior tibial artery, for example, being sometimes not larger than a nut, while those of the larger vessels reach the size of an orange, or often larger. Another characteristic symptom of aneurism is its diminution upon pressure, whether applied upon the tumor itself or higher up along the course of the arterial trunk which supplies it, or upon the main trunk of the limb upon which it has its seat. This diminution is, however, more marked in true than false aneurism. When, in such a test, pressure is entirely removed, the tumor rapidly resumes its original size; but in the treatment of the disease, by means of continuous pressure, as will be presently explained, this dilatation does not supervene upon the removal of the pressure.

Aneurisms often produce considerable local pain, if so situated as to press upon the nerves of the part; the pain varying in character and degree according to the amount of pressure, and the connection of the tumor with the affected nerve. The same pressure upon the local nerves which produce pain, may also create various muscular phenomena, such as cramp, spasm, etc. An aneurismal tumor is, however, usually free from pain, at least until it has attained such a size as to be painful from mere tension. The skin over the tumor also remains for a long time unchanged, seldom presenting evidences of inflammation until the size of the tumor is such as to interfere with the capillary circulation; but when congestion supervenes, a train of symptoms ensue which are similar to those which were explained in connection with the subject of tumors. When congestion of the capillary vessels of the skin induces inflammation in this tissue, it soon developes ulceration, suppuration, or sloughing, by which the aneurismal sac is opened, and violent and often fatal hemorrhage follows.

As the tumor grows, its pulsation often diminishes, so that it is no longer noticeable at a distance, though to the touch it will be

gnized even when quite feeble; at the same time the elastic
acter of the tumor diminishes; both these changes being due
anges within the tumor, which will be presently detailed.
hould the aneurism be so situated as to produce pressure upon
portion of the skeleton, absorption, or even caries of the bone
ensue. Should the veins of the part be pressed upon, other
-marked symptoms will appear, and as the return of the
d to the heart will now be impeded, there will be more or less
age of its watery portions into the cellular tissue beneath the
, which will produce œdema. Thus, for example, if the
rism be situated in the iliac artery, and pressure is made by
tumor upon the iliac vein so as to impede the circulation in
vessel, œdema of the lower extremities will be the result.
ll aneurisms are liable to terminate in two ways; either by
h or by cure, nature being capable, under certain influences,
ccomplishing a cure. When a cure is accomplished by nature,
generally consequent upon changes within the sac, resulting
a deposition of lymph upon its walls; this deposition being the
equence of inflammatory action, or a change in the circula-
of the blood in the sac, and resulting in a laminated fibrin-
structure which gradually, layer by layer, increases the thick-
of the sac, until its cavity is closed. When an aneurism
inates fatally, it is accomplished in the following manner:
aneurismal tumor grows larger, and the sac thinner, owing
s constant distension from within outwards, while the various
ctures between the tumor and the skin gradually waste and
removed by absorption; as the pressure encroaches upon the
, ulceration occurs, or sloughing takes place, and the cavity
he sac being opened, blood escapes with a sudden gush, and
patient dies generally upon the spot. Although this is a
mon mode of termination, and although it may be stated in
d numbers that nine out of ten of the cases of aneurism ter-
ating fatally perish by hemorrhage, yet this is by no means
ersally the case, as a sac may form within the aneurism.
th may also ensue from pressure upon the neighboring vis-
; or, it may be a consequence in aneurism of the arch of the
a, or indeed in aneurisms of the thoracic aorta generally,
ressure upon the thoracic duct, or on the heart and lungs, etc.

As might be expected from the nature of the disease, in every aneurism of considerable size, various pathological changes result, not merely in the parts affected, but even in the vessels at a considerable distance from the seat of the tumor, besides which there are various diseased conditions, which are the result of pressure upon the surrounding parts.

Differential diagnosis of Tumors as distinguished from Aneurisms.—Tumors situated over arteries, and receiving pulsation from them, may be distinguished from aneurisms by noticing, 1st. That they do not pulsate at first, when they are small; whereas aneurisms do so from their earliest formation. 2ndly. That a tumor may often be lifted up from the artery, and then it will cease to pulsate. 3rdly. That aneurisms are generally soft at first and become hard subsequently; tumors are generally the reverse. 4thly. That tumors connot be emptied by pressure, and that no alteration is made in their consistence by compressing the artery above. 5thly. Enlarged lobes of the thyroid gland may be distinguished from aneurism of the carotid, by their slipping up out of the fingers, along with the larynx, in the act of deglutition. 6thly. Psoas abscess may be known from aneurism by the precursory pain and weakness in the back, and by its disappearance when the patient lies down. 7thly. Pulsating tumors composed of erectile or cancerous growth—especially those connected with bone—are sometimes mistaken for aneurisms; from which, in fact, it may be hardly possible to distinguish them during life, since they may have the same kind of pulsation, attended with the same whizzing noise, and checked, like that of aneurism, by pressure on the artery above. The mistake, however, is of no very serious consequence, because the ligature of the main artery, which would cure an aneurism, might check the growth of the tumor.

Growth of Aneurism.—As an aneurism enlarges, its coats become thinner, but are strengthened by the adhesion of the parts around. As the enlargement proceeds, these are gradually absorbed; bone offers no resistance, but is absorbed as well; and at last the tumor reaches the skin and distends it. Inflammation succeeds, the skin becomes red, thin, livid and vesicated, and finally sloughs.

/hen the edges of the slough separate, a fatal bleeding ensues; etimes in a gush, sufficient to destroy life at once; although e frequently the blood oozes away slowly. But an aneurism burst into a mucous canal; or into a serous cavity, or into in, with, of course, a fatal disturbance of the circulation, if vein is large; or into the cellular tissue of a limb, or it may e death through its pressure on the trachea or œsophagus, or ugh the pain and irritation caused by its compressing nerves terfering with the abdominal viscera, without bursting. We observe that when an aneurism opens into a mucous canal it ually by a small round ulcerated spot, not by a slough, as in kin; when it bursts into a serous cavity, it is generally by a k or fissure.

tiology.—The causes of aneurism may be grouped into two ral classes—the *predisposing* and the *immediate*.

mong the predisposing causes may be mentioned the shape of vessel, the points where it has a curvature being most apt e affected. Old age is also a predisposing cause, and so are matism and gout. So also is the abuse of alcoholic drinks, drunkards being said to be peculiarly predisposed. Sex also ts influence, the disease being more common in the male than ne female, probably because man is exposed to more violent continuous muscular exertion than woman.*

---

*It is a singular fact, that there are more cases of aneurism in Cali- a than in any other portion of the United States, not excepting the lous and multinational city of New York. Within the period of e years and four months, terminating September, 1868, there were rted in San Francisco, Cal., 119 deaths from aneurism, or a yearly age of 42. The average population of the city for that time being t 126,000, there was one death from aneurism for each 3,000 inhabi-, making the ratio about nine times greater than in New York city. class of persons affected with aneurism lived a rough, uncertain life, no settled home or steady vocation, tossed upon the sea of life and ked upon the shoals of disappointment. Nearly all had tried the s, worked hard and late, lived in a rough, exposed manner, imbibed y of stimulating drinks, returned disappointed to the city, taken ngs in the rickety habitations of the city front, and worked by the or day at heavy, laborious, unsteady labor alongshore. Idle and lute in their habits, with frequent attacks of rheumatism and ilis, there were found in the autopsical examinations made, ather-

Various diseases in the coats of the vessels are set down as predisposing causes, especially atheromatous or fatty deposit. This, according to Bennett, presents the appearance of a whitish or yellowish cheesy substance, though sometimes indurated and brittle, like calcareous degenerations generally, being deposited between the coats of the vessel, and often protruding into it. The deposit consists of numerous fatty granules, mingled with crystals of cholesterine, which, when hard, also are mixed with calcareous amorphous salts.

Among the immediate or exciting causes of aneurism are wounds and injuries to the arteries, sprains, violent exertion, and mechanical injuries of all kinds.

Prognosis.—The prognosis in the case of aneurism is generally serious, and should always be guarded. As a general rule, it may be set down that an aneurism will terminate fatally if left to nature, though this is not invariably the case, while the time which may elapse between the first formation of the tumor and its fatal issue may vary considerably, depending upon the position of the aneurism, the constitution of the patient, etc. The prognosis as regards operations should be made guardedly; often they are successful, but very often, also, they fail, and no positive prognosis can be made except in traumatic aneurisms.

Situation.—The most favorite situation of aneurisms is in the aorta, near the heart; but if aneurisms of the aorta are excluded from our consideration (since they are not to be relieved by any surgical interference), we shall find that, of all the arteries of the limbs, the popliteal is the most frequently affected. Thus, out of 179 cases of spontaneous aneurism collected by Lisfranc (not including any of the aorta), there were 59 of the popliteal artery, 26 of the femoral in the groin, and 18 in the femoral at other parts; 17 of the carotid; 16 of the subclavian; 14 of the axillary, 5 of the external iliac; 4 of the innominata; 3 of the brachial, common iliac, and anterior tibial, respectively;

---

omatous, fatty or calcareous degeneration of the arterial coats. Strains and laborious (irregular) exercise are often productive of atheroma, and it is a recorded fact that the great Liston died of thoracic aneurism, attributed to the violent exercise of rowing, having been considered the best oarsman in England.

of the gluteal, internal iliac, and temporal, respectively; and of the ulnar, perineal, internal carotid, radial and palmar arch, respectively.

Spontaneous Cure.—Every aneurism does not present the fatal course herein described, as in a few cases, spontaneous cures have been effected. 1st. The most natural and obvious, although unhappily a very infrequent mode of cure occurs, when a laminated coagulum lines the sac in sufficient quantity to resist further dilatation; or conversely, when the propulsion of the blood into the tumor is so languid as to allow of the formation and solidification of the clot. And here it should be observed that a distinction is to be made between an *active* and a *passive* clot. The *active* consists solely of fibrin slowly deposited from the blood on the unnatural surface, with a tendency to remain permanently as a false membrane, and to check the disease; and the formation of this is promoted, as before remarked, by everything that renders the circulation languid, without stopping it altogether. The *passive* clot, on the contrary, is a mass of coagulated blood, such as may be produced by cutting off any quantity of blood from the circulation, as in ecchymosis; and this, as we have shown before, is rarely susceptible of becoming organized, but usually is dissolved and absorbed, or occasionally gives rise to suppuration and is discharged. Yet a second mode of spontaneous cure is sometimes found to be caused by violent inflammation or abscess, in which the aneurism and artery are involved, so that the blood in the sac is made to coagulate, and the artery obstructed by coagulum. 3rdly. It has happened in a few fortunate cases, that a portion of clot has been detached from the interior of the sac by some accidental violence, and has effected a cure by blocking up the opening into the aneurism. 4thly. The artery has become obliterated by an accidental pressure of the aneurism upon it, or by the pressure of blood escaping from it on its bursting into the cellular tissue.

Treatment.—As in all those cases where *spontaneous cure* is effected, it is known that the formation of fibrin has acted an essential part, therefore it is the duty of the surgeon to imitate this conservative process of nature, by the employment of those agents, the effect of which will tend to bring about this desired

result. To accomplish this, two general methods have been recommended, viz: the medical and surgical. The first has reference to those agents, either locally or constitutionally applied, which cause coagulation and consequent fibrination of the blood. The second comprises those processes which produce a *retardation* or arrest of blood in the sac. As heretofore observed, in order to produce coagulation of fibrin within the sac, the blood must be in a comparatively quiescent state, not absolutely at rest, but so gently agitated that gradual deposition of fibrin may take place, thus persistently and effectually closing the sac, as it is by this deposition of fibrin alone, that the sac can be occluded; of the two modes, the accomplishment of the desired result by remedial agents is the most to be preferred. To effect this, the patient and the part should be put in the most favorable state for the consolidation of the tumor, and though it may not be possible in all cases, to bring about a cure in this way, yet the disease may be palliated or even retarded in its progress by these means. They consist in moderating the force of the heart's action, so as to diminish the strength of the current against the walls of the vessel; and secondly, so to modify the condition of blood as to lead to its fibrination. In carrying out these indications it must be borne in mind, says a distinguished writer, that "there are two opposite conditions of the system in which aneurism occurs," the one in which there exists a *plethoric*, the other an *anæmic* tendency. The first chiefly occurs in young subjects, in whom the progress of the disease is acute and rapid, attended with perturbation of the circulation, excitability of the heart and throbbing of the arteries generally. The other condition exists principally among old people, in whom the powers of life are enfeebled, with a cachectic habit of body, and a tendency to anæmia, as is shown by a feeble pulse and a flaccid heart. In this state of the system the disease makes slow progress. In such opposite conditions of the system, it is patent that the same plan of treatment cannot be successfully pursued, and the constitutional means must be modified to meet the indications present in each.

The remedies most appropriate to control the force of the heart's action and irritability of the arterial vessels, are *Aconite*, *Actea rac.*, *Gelseminum*, *Cactus grand.*, *Digitalis*, *Spi-*

gelia and *Veratrum vir.*, the selection of the remedy depending upon its adaptation to the conditions involved. After the arterial impulse has been controlled and the irritability of the heart and arteries brought to its minimum of circulation, either of the following remedies may be employed for their curative action, viz.: *Lycopodium*, *Lachesis*, *Carbolic acid*, *Bryonia*, *Calcarea carb.*, *Carbo veg.*, *Mercurius*, *Rhus*, *Secale cor.* and *Sulphur*, according to their respective indications. Dr. A. S. Ball,* of New York, reports *three* cases or aneurism cured by *Lycopodium*, one of which was situated in the occipital artery, one in the region of the aorta, and one in the course of the carotid artery. Dr. Von Gottschalk, of Providence, R. I., in vol. 9, of the same journal, p. 49, reports an exceedingly interesting case of aneurism of the aorta, greatly benefitted by the internal use of *Actea racemosa* (fourth dilution). Dr. William Roberts, Physician to the Manchester Royal Infirmary, reports in vol. 21, of the British Journal of Homœopathy, p. 494, the successful use of the *Iodide of potassium* in the treatment of several cases of thoracic aneurisms. The dose of the remedy is five grains of the salt three times a day and continued until the subsidence of the general symptoms, when the remedy may be decreased in quantity from time to time until its withdrawal altogether. The beneficial effect of the *Iodine* is attributed to its power of increasing the coagulability of the blood and the deposition of the fibrin in the cavity of the aneurism. Dr. Chuckerbutty, of Calcutta, while treating a patient with *Iodide of potassium* for a considerable length of time for an obstinate cough, was surprised to find that at the termination of treatment, he had cured his patient of aneurism of the innominate artery by its becoming solidified. Dr. Balfour also speaks very positively of the success following the use of this remedy, and is disposed to place it at the head of medicinal agents, especially in internal aneurisms where surgical appliances cannot be brought to bear upon the disease. The cure is effected by means of coagula formed in the sac and final solidification of the aneurismal cavity. The first effect of the remedy is to relieve

* North American Journal of Homœopathy, vol. 8, pp. 68, 69.

the pain, even before there is any perceptible result produced upon the tumor. Prof. Langenbeck reports recently on two cases of aneurism treated by the hypodermic injection of ergotine. He injected three centigrammes of the aqueous extract of ergot over the tumor, in the first case, with almost immediate relief of the pain. In six weeks he injected about thirty grains of the ergotine with the effect of almost entirely relieving the venous congestion and paralysis of the arm, while the tumor was sensibly diminished, though a perfect cure was not effected. The second case involved the radial artery, the aneurism being immediately above the wrist. One-fourth of a grain of the aqueous extract of ergot* dissolved in equal parts of glycerine and alcohol, was injected into the skin above the tumor, when on the following day the tumor seemed to have entirely vanished, with nothing remaining except a local erythematous inflammation, which lasted only for a few days.

In addition to the medical treatment adopted, it is of the utmost importance to keep the patient perfectly quiet in bed and free from all mental excitement whatever. The diet also should be carefully regulated; not that the patient should be *suddenly* deprived of either fluid or solid food, or should at any time submit to absolute privation by hunger or thirst, but it is recommended that the quantity of the ingesta be of the smallest reasonable standard, while care is taken that their quality shall be of the most nutritious character. The diet should be gradually reduced and regulated in quantity, consisting of farinaceous food with a small quantity of meat, little liquid, and a total abstinence from all stimulating drinks. Dr. I. N. Eckel, of San Francisco, Cal., reports an interesting case, verifying the good results following the use of *Secale cornutum*, in the following:

Mrs. S., age 46 years, residing in this State for the last eighteen years, always enjoyed good health until lately. Within eighteen months she was attacked, as she thought, with "false pleurisy," as the pain was not constant. She did not look for medical aid.

---

* R. Ex. Secale cornutum aq: M X L.
Spts. vin: Rect;
Glycerine, *a a* 2 oz. M.

April 23, 6 P. M. I was called to see her. Found her sitting upright in bed, leaning with her head forward towards the left; countenance expressing a great deal of distress. She said she had such excruciating pains in the shoulders, chest and arm, under the axilla, that she was afraid to move. The tumor is as large as an English walnut, marked pulsations in the fossa triangularis, fossa subclavicularis, extending towards the second rib; parts exceedingly sensitive to touch. Told me it grew rapidly the last three months. Left arm very painful and swollen; could not raise the hand without pain in the arm and shoulders; was not able to use the arm; pulse in the left arm weaker, and somewhat slower than the one in the right.

I ordered ice-water compress, to be renewed every hour. *Aconite* and *Bryonia* that night were given. On the 24th no change whatever; tried *Lachesis*. On the 25th, patient the same. Injected three drops *Secale corn.* (English preparation; it is said one drop is as strong as one grain of the powder) under the skin, over the centre of the tumor; cold water to be continued. Five o'clock, P. M. the same day, I visited the patient again, who had slept four hours during the day; the first "nice" sleep she had within a week, and all acute pain had left her in the arm and chest. The tumor, however, still sensitive.

Second injection was made April 27th. Slept again a few hours after the injection. Third injection, April 29th; fourth, May 1st; fifth, May 5th. Here a slight erysipelas set in, and I was obliged to omit the injections for four days.

On the 10th, the sixth injection was made, as the erysipelas had entirely disappeared. Swelling much less; tumor not sensitive; can move the arm, the swelling of the latter disappeared; the pulse in the left radial artery stronger. All her friends are noticing the decided change in the swelling. She is able to lie flat on her back, can raise the arm, has lost the difficulty of swallowing (however, the latter was slight, though she spoke of it when I first saw her), and sleeps from four to six hours quietly every night.

On June 1st, I made the twelfth, and for the present the last subcutaneous injection.

The last four injections I used ten drops. In all, seventy-five drops of *Ergot*. No bad results from the remedy occurred. I saw the patient every day, and on those days I made the injections, twice daily; see her now once a week, to watch progress.

On June 6th, ordered the patient out doors. She has now a good appetite, sleeps well, no pain; pulsations very faint.

June 14th. The aneurism reduced one-half; patient has no complaints to make; can dress again her own hair, which she had not been able to do for several months; pulsation very faint.

Regimen.—The regimen recommended by Bellingham, if strictly carried out, fulfills all that is of value in this direction, and consists of two ounces of bread and butter for breakfast, two ounces of bread and a like amount of beef for dinner, and two ounces of

bread for supper with an occasional sip of milk and water. If the heart's action is particularly strong, *Aconite*, *Digitalis* or *Veratrum viride*, may be given from time to time to break down the vascular plethora, the indicated remedy being suspended, to be renewed again as soon as circumstances warrant. By a careful attention to this manner of treatment, and by adapting the remedies to the characteristics of the case, consolidation of the tumor may take place with a complete restoration to health of the sufferer.

In aneurism of the *second* class which occurs in feeble cachectic and anemic persons, the above plan of treatment is entirely inadmissible. The treatment in this condition will have to be directed to overcome the infirmities of system and to invigorate the powers of life. In these cases the blood is deficient in febrin, the constitution irritable from debility and the action of the heart irregular through loss of vital tone. Under these circumstances, complete rest should be imposed, and the administration of either of the following remedies, according to their respective indications, *Acetic acid*, *Actea rac.*, *Arsenicum*, *Calcarea carb.*, *Carbo. veg.*, *Carbolic acid*, *China*, *Lycopodium*, *Ferrum*, *Jodium*, *Mercurius*, *Nux vom.*, *Sulphur*. In fact, those medicines which are called for in anemia will be found to exercise a beneficial action over the constitutional defects, while the remedies demanded to meet the aneurismal disorder will have to be selected in accordance with their therapeutical range of action. I have found *Lycopodium*, *Actea rac.*, *Digitalis*, *Carbolic acid* and the *Iodide of Potash*, to possess more marked virtues in subduing this affection than any of the other remedies named. In this condition of system I would recommend daily inhalations of oxygen gas for the purpose of building up the patient by sustaining and invigorating the digestive and assimilative functions, and imparting fresh life and vigor to the debilitated organism. The effect of this gas in such cases is to assist in a powerful manner the shattered functions, to give more oxygen to the lungs for the purpose of dissolving and removing the carbonaceous materials that are accumulating and blocking up the avenues of health, that they may be the better able to receive and appropriate the nutriment necessary to sustain and preserve the organism in its integrity.

In addition to the medical treatment recommended, it is neces-

sary that the patient have a dry and nourishing meat diet, especially if he be advanced in years, or occupies the lower walks of life. Frequent observations have taught me that although medical treatment at times may have exercised a curative control over this affection, still I do not feel warranted in excluding the various surgical processes which may be called into requisition. For those internal thoracic aneurisms where surgical means are inappropriate, medical means have been employed, in some cases, with the most satisfactory results.

Surgical Treatment.—The processes by which aneurism is treated surgically, consist, first, in the *retardation* of the circulation of blood in its flow to the sac: second, the *entire arrest* of blood in the course of the vessel toward the tumor. The first method is produced by *pressure*, the second by the *ligature*, and of the two, the first is undoubtedly to be preferred.

Pressure.—In treating external aneurism, there are several methods by which this agent may be applied: First, by adjusting a *bandage* firmly around the limb, commencing at the extremity and mounting upwards beyond the site of the tumor. Second, by *direct* pressure upon the tumor. Third, by pressure upon the artery at the cardiac side of the sac, by means of a tourniquet. Fourth, by exerting the same pressure at the distal side of the tumor. Fifth, by means of digital compression; and, Sixth, by flexion of the limb.

Bandaging.—By the proper application of this process, by preserving the limb in a complete state of rest and retaining it in the horizontal position, there is, undoubtedly, more or less retardation of blood through the arterial channels, and especially into the aneurismal sac, which, under favorable circumstances, will exercise a curative action in the tumor, by inducing fibrination of the blood, and consequent obliteration of the aneurismal sac. This operation is slow in its results, but conjoined with the remedial agents previously mentioned has, in the hands of the author, produced a most satisfactory cure. In aneurisms of the lower extremity, it is advised that this process be first applied, and the internal use of *Iodide of Potassium*, or other remedies employed as previously recommended, failing in which the surgeon may resort to the process of

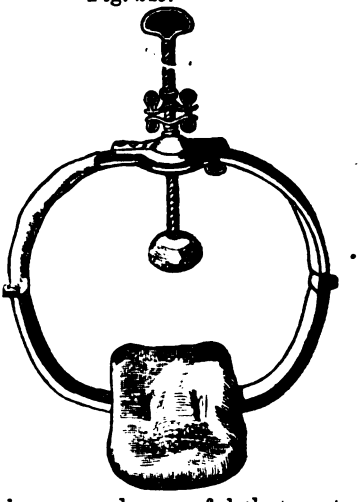
Pressure.—In the use of this agent, a very important consideration is to apply the pressure by means of a proper instrument upon the cardiac side of the tumor. Pressure upon the tumor, or upon the distal extremity of the vessel is not productive of such beneficial results. Pressure upon the cardiac side has for its object the arrest of the circulation through the sac to such an extent as to cause it to be filled up rapidly by the concentric laminæ of lymph already alluded to; but the surgeon should ever bear in mind that the chief object of pressure is not to *interrupt* altogether the volume of blood through the artery, but merely to *diminish* the current flowing through the sac. Pressure as a remedial agent in the treatment of aneurism, is of ancient date, and although the principles upon which it was formerly conducted were unscientific and crude, yet many cures have been reported illustrative of its efficacy. Having almost fallen into disuse from the lack of general good results following its application, until quite a recent date, the practitioners of Ireland, and especially, Mr. Bellingham, of Dublin, have revived this process, though in a modified form, and to them should be accorded the credit of proving the usefulness and excellence of this system. Dr. Bellingham, in a paper upon this subject, was the first to point out the correct and scientific principles upon which the operation was based, and to teach the manner in which it acts in curing the disease.

This surgeon applies pressure in the course of the vessel, but so as only partly to interrupt the circulation through the tumor, making the pressure sometimes upon the tumor itself, but most generally at some little distance from the sac, upon the artery supplying the tumor, between it and the heart, in precisely the same relative position that Hunter suggested ligation for aneurism. The most successful mode of making pressure is, however, to make it between the tumor and the heart, in addition to which pressure upon the tumor itself may advantageously be combined.

The means by which pressure upon the course of the vessel supplying the tumor can be effected, without checking the circulation through the whole limb, are various. One is through a tourniquet, which consists of two pads fixed upon shanks of steel, that are made to approximate each other by means of a

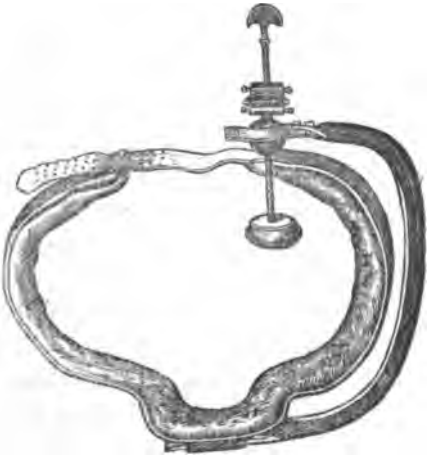
screw, an instrument similar to which attention has recently been invited in the New England States, and which has been spoken of as a new invention, but which is really very old, and is a modification of Signorini's tourniquet, Fig. 249. This instrument, however, by unvarying pressure upon a single point, is very apt to give such pain that it can seldom be borne. A much better plan of effecting this pressure is by means of the instrument which has been above described as Bellingham's Compressor, an instrument which has proved so useful that, out of thirty-nine cases of aneurism treated by means of it, thirty were cured. In every case of aneurism to which compression is applicable, I would recommend its use before resorting to so extreme a measure as ligation of the artery, an operation which in some cases cannot be regarded as justifiable until compression has been tried.

Fig. 249.



In compressing the femoral artery for the relief of popliteal aneurism, by Bellingham's plan, two instruments are necessary, each consisting of a steel band, having at one extremity a pad, to compress the artery, which can be tightened by means of a screw, and at the other a larger pad, to act as a support, Fig. 250, the two instruments being

Fig. 250.



placed upon the thigh, so that they can be made to act alternately, the second being tightened as the first becomes painful, and the first then relaxed, so as to keep up a uniform interruption of the current in the vessel; but the compression should never be violent enough to entirely interrupt the current of blood, but merely to modify and diminish the tidal flow. This pressure requires, if any success is to be derived from it, to be patiently persevered in from five to twenty days, and even longer, if necessary to complete the cure. Another form of compression, and one that is suited to the brachial artery, is that made by a spring, which is connected with a strap so as to buckle around the limb, while the pad is capable of being pressed upon the artery by means of a screw. It is applied the same way as the clamp of Bellingham.

Dr. Carte, of Dublin, has invented an ingenious apparatus of vulcanized india-rubber, which substitutes an *elastic* force in lieu of the unyielding pressure of the screw. This instrument better accommodates itself to the limb, and is less likely to produce injurious compression. The local symptoms supervening on the application of compression should be carefully watched, and the pressure, when it becomes painful at one spot, relaxed, by alternate pressure at another. Pressure may also be applied by the fingers of a number of assistants, who may be relieved from time to time, but not so advantageously in most cases as by instruments.

In attempting the cure of aneurism by means of compression, it is important to remember that, during the entire course of treatment, the limb should be kept in the horizontal position, and neatly bandaged from the extremity upwards, so as to guard against œdema or inflammation of the skin. It is also necessary that pressure should be applied *very gradually*, as it is sufficient to *moderate the circulation, without obstructing it.*

By this *alternating* process I have succeeded in curing a popliteal aneurism within five days, the patient making a complete and permanent recovery.

The success of compression, as shown by Dr. Morris, of Philadelphia, in his excellent papers on Statistics, etc., shows that of thirty-seven cases thus treated, thirty-five were cured, one dying of heart disease, and one being ligated; while in two hundred

and four cases treated by the ligature, fifty died and six were compelled to submit to amputation of the limb. The success of the treatment by compression depends largely upon the attention paid to the minor details, which, though trivial in themselves, become of importance when taken as a whole. Thus, the general health of the patient must be maintained by those dietetic and medical principles already alluded to. The irritability of the heart and arteries must also be subdued by the administration of those remedies which exercise a healthy control over those organs; the patient should be placed upon a comfortable bed, with firm and well secured pillows and mattresses, so that his position be not changed; the limb should be washed clean, well dried, and dusted with skin powder; the cuticular hairs be shaved before the application of the bandage, and the compressor be well padded in every part, so as not to fret the skin.

The pressure, if possible, should be continued during sleep, but if it interfere greatly with the patient's rest, it may be necessary to administer an opiate, per the suggestion made by Dr. Tufnell, of Dublin, of unscrewing the instrument *slightly*, and when the patient falls asleep, gently tightening it again without awakening him, may be advantageously adopted. A very slight unscrewing will relieve the pain attendant upon compression. The manner of *alternate* pressure, however, obviates these disadvantages, and in my opinion affords the best means of curing this disease by compression. To guard against abrasion and injury to the skin, it is advised to bathe the parts that have been pressed upon with a solution of *Arnica* and keep them moistened with the lotion until the instrument is replaced. This is applicable to the alternate pressure spoken of above, and if used in connection with such pressure, there is little fear of any injurious results from this mode of treating aneurisms.

The effects of Pressure.—The effects of pressure upon the tumor vary considerably. In some cases solidification takes place rapidly; more often, however, it takes place gradually, the aneurism becoming more painful and solid, its pulsation and bruit becoming less and less distinct. While the process of solidification is taking place, a good deal of restlessness is experienced, with a feeling of general uneasiness, with more or less constitu-

tional disturbance, which is best quieted by the use of *Aconite*, *Gelseminum*, *Belladonna*, or other remedies. The tumor becoming harder as the pressure is continued, the anastomosing branches enlarge, producing more or less burning pain in the limb, and arterial pulsations may be observed in situations where before none could be felt.

The burning pain experienced in these cases is due, says Tufnell, to the enlargement of the arteries and pressure upon the trunks of the nerves following the course of the vessels. After complete solidification of the tumor has taken place, the compression ought to be continued for at least forty-eight hours, to secure the patient against the occurrence of a relapse.

Another method of compression in the treatment of aneurism is the principle devised by Mr. George H. Porter, of Ireland, which consists in arresting the circulation in the artery by means of a metallic compressor acting somewhat upon the principle of acupressure, and yet possessing advantages over both that method and the direct application of the ligature. This instrument is of small size and made of silver or iron wire, about the size of an ordinary probe, bent into a triangular shape, half an inch wide at its base and four inches in length upon its sides, with a small ring fixed at the apex of the triangle, and the base perforated by two small apertures, just large enough to admit the passage of a small silver wire. In applying this instrument an incision is first made down to the vessel, around which the wire is carried with an aneurismal needle; the needle is then withdrawn, and the two ends of the wire are passed through the openings in the base of the triangle and attached to the ring in its apex, thus exerting any required degree of pressure upon the artery, which is clasped between the wire beneath and the base of the triangle above. If it be true, as has been stated by Dubois, Percy, and Compton, that it is unnecessary to cut the inner coats, in order to arrest the circulation sufficiently to preclude aneurism, we should be disposed to regard this little instrument as admirably adapted for this purpose, as, according to its inventor, it may be held upon the artery for sixty hours, without inflicting any injury to its coats, and can be conveniently removed without injuring the vessel, by cutting the wire at its attachment to the ring and

withdrawing it from beneath the vessel. By thus preserving the structures of the artery, all danger from secondary hemorrhage is avoided, which sometimes occurs after the use of the ligature, especially where we are compelled to apply it too near an arterial branch.*

So far as success in the use of this instrument is concerned in the cure of aneurism, I have no data to guide me in expressing an opinion as to its superiority over other methods, but am disposed to believe that under certain circumstances it may be advantageously employed under the conditions mentioned above.

Digital Compression.—The treatment of aneurism by digital compression is of very recent origin. It has sprung directly from the successes, and it may be also truly said from the failures, of the treatment by mechanical pressure. The first recorded case in which digital compression was successfully employed for aneurism, appeared in the Medico-Chirurgical Transactions for 1845, the patient having been under the care of Mr. Greatrex, and the digital compression was employed in conjunction with the tourniquet.

Subsequently to this, in 1848, Dr. Knight, of New Haven, Conn., employed digital compression in a case of popliteal aneurism with complete success.

Prof. Vanzetti, of Padua, was the first European surgeon to show the value of digital compression, and is entitled to the merit of first clearly fixing the attention of the profession to this new method of treatment. He says, "having half an hour at my disposal, I attempted at once the digital compression of the humeral artery, without troubling myself to keep up a pressure absolutely constant. Half an hour had not passed when I ceased the pressure, and examining the tumor I found it without pulsation, without souffle and already solidified." Upon continuance of the pressure for fifteen minutes longer, to make more sure of the solidification of the tumor, the arm was placed in a sling, and at the end of ten days the patient returned to his home permanently cured. In the July number of the United

* Report on the Progress of Surgery, by Prof. E. A. Clark, St. Louis, Missouri.

States Medical and Surgical Journal, 1868, a case of traumatic aneurism of the superficial palmar arch is reported as having been cured in thirty minutes by digital compression. Since then quite a number of brilliant cures have been reported by this method, until it has almost superceded the other processes, in the confidence of the profession, especially in external aneurisms. It has been objected, by some surgeons, that from the number of assistants required in the digital method of treatment, it could not be made serviceable except in large hospitals; the contrary of this is true, for in several cases cures have been effected by the unaided pressure of the surgeon alone, and in two or three instances, even by the patient himself. Most surgeons are of the opinion that the pressure, as a rule, should be *intermittent*. The *continued* pressure, having produced some excellent results, is, nevertheless, prone to produce "coagulation *en masse* of the contents of the sac with all its accompanying dangers, while the intermittent treatment favors the safer form of laminated fibrinous deposition."

Continued Flexion.—"The simple bandaging of the limb in acute flexion," says Holmes, "the patient being kept at rest, may occasionally succeed in curing aneurisms situated at the bend of the limb, as in the popliteal space, or the elbow, and possibly the groin." The cases best adapted for the trial of flexion are the simplest. In a tumor of small size, with no inflammation of the skin covering it, without involvement of the joint, and where, as far as can be ascertained, the tumor is seated on the superficial face of the artery, benefit may be anticipated from the flexion treatment. In this process the limb should be bandaged from the toes nearly to the knee (if the aneurismal tumor is situated in the popliteal space) with a single-headed roller; it should then be deflected, and made to pass over the thigh and leg, flexing and retaining the limb at an acute angle; the limb should then be flexed upon the pelvis, and the knee rested against a pillow. If the flexion of the limb demonstrates a change in the bruit of the tumor, the prognosis will be favorable; if not, a compressor may be applied to the artery above in aid of the flexion. In the hands of a few surgeons this process has met with excellent and most satisfactory results.

The Ligature.—The next plan of treatment is the application of the ligature upon the affected artery. Under favorable circumstances, the cure of an aneurism after ligation of an artery may be regarded as almost certain. In olden times it was the practice to apply two ligatures upon the affected vessel, one upon the cardiac and one upon the distal side of the tumor, after which the sac was laid open, its contents removed, and the clots turned out. This was the practice generally adopted up to the time of John Hunter, of England, who was the first to modify the old operation and present a different process. His procedure was to apply the ligature to the sound part of the artery, at a considerable distance from the tumor, and between it and the heart, his object being to cut off the current to the seat of disease by interrupting the circulation. The supply of blood being in this manner shut off, the sac collapsed, its walls adhered, producing gradual obliteration of the tumor, while the circulation through the limb was carried on by means of anastomosing branches.

Brasdor, on the other hand, applied his ligature on the distal side of the artery affected, his object being to arrest so much of the flow of blood through the sac that its consolidation may take place in the usual way, by the deposit of laminated fibrin. In the Hunterian method this is effected by fibrinous deposit, by completely arresting the flow of blood through the sac. The present method of ligating an artery for aneurism is founded upon the principle that the farther from the disease the sounder are the coats of the vessel, and therefore the more capable of bearing the application of the ligature. Hence it is recommended to cut down upon the vessel some distance above the aneurism. The ligature of the artery for aneurism succeeds best in those cases in which the tumor is circumscribed, of moderate size, slow in its growth, having a tendency to consolidation, and unaccompanied by œdema of the limb. This operative procedure should be avoided when there is any serious disease in the heart, as also in multiple aneurisms, where the second tumor is situated internally; but it has happened, however, that two aneurisms in one limb have been cured by one ligature, applied to the cardiac side of the tumor, nearest the heart. If the presence of aneurisms in different parts of the body indicate an aneurismal diathesis, it

would be manifestly unwise to resort to operative procedure. In very *acute* aneurisms, in which the tumor has grown rapidly, with forcible pulsation, where each tidal wave is driven into the sac with increasing violence; in *axillary* aneurisms, where the surrounding tissues are loose and yielding, predisposing to suppuration and sloughing of the sac; in *diffuse* aneurisms, with coldness of the limb and a tendency to incipient gangrene, and in *ossification* of the arteries, ligation of the artery is a dangerous procedure.

If, however, an operation is decided upon, in preference to compression, the artery should be ligated, neither too near the aneurism, so as to place the ligature on a portion of the vessel that is diseased, nor too far from it, lest the circulation be kept up by means of collateral branches, but as a general rule between the aneurism and the heart. After ligation of the vessel the temperature of the limb falls a few degrees, but in a few hours it rises higher than that of the opposite extremity, in consequence of the blood being forced to circulate through the superficial capillaries. Subsequently it sinks again below the natural standard, which requires caution on the part of the surgeon as to the after treatment. The patient should be placed in bed, with the limb in an easy position, and well wrapped up, to preserve its circulation, and the general condition of health attended to as demanded by existing symptoms.

Gangrene has sometimes followed the ligation of an artery, in which event those remedies recommended for Gangrene (page 287, vol. 1) will be required; in case, however, the gangrenous inflammation extends beyond the fingers and toes, and no beneficial effects follow their use, amputation, as a last resort, should be performed above the level of the ligature.

Manipulation.—In two cases of aneurism of the right subclavian artery, between the scaleni muscles, Mr. Fergusson devised the plan of blocking up the artery by fibrin squeezed from the sac. He first emptied the sac by pressure with his thumb, then deliberately squeezed and rubbed the opposed surfaces against each other, so as to force some of the fibrin into the artery. The effect in both cases was immediate and striking. In the first place there was giddiness; in the second partial hemiplegia, indicating that the brain had become affected by por-

tions of the fibrin carried into its structure. In the first case, after one or two repetitions of the manipulations, all circulation in the vessels and its branches below was arrested, and the tumor became smaller and firmer. This continued for several months, when the patient finally succumbed, the tumor bursting into the brachial plexus. In the second the tumor became gradually less, the patient being alive and well two years after the manipulation. In this case it may be mentioned that all pulsation had ceased from the arteries below for some months before the manipulation. In an analysis of these two cases it appears that little curative benefit results from the manipulation process, although future experience in this direction may develop more hopeful terminations. It may be applicable, however, after medical and other milder measures have failed, especially in aneurisms about the neck, and more particularly of the subclavian artery.

Galvano-Puncture.—Attempts have been made to procure consolidation of an aneurismal sac by the use of electricity or galvanism, a principle recently revived by certain French and Italian surgeons, although first practiced by Mr. Phillips about the year 1832. The principle involved in this process is to produce coagulation in the sac, by introducing two acupuncture needles into the tumor in opposite directions, keeping them in contact with one another, and connecting them with a galvanic battery of moderate power, when the coagulum will become deposited around the needles. To be successful, the operation requires to be repeated several times, varying from ten to fifteen minutes each time. Petrequin recommends that the direction of the current be changed from time to time, so that a number of clots may be formed in the sac. The liability to inflammation of the sac and surrounding structures, its disposition to slough, and the occurrence of secondary hemorrhage, with loss of limb and life, has thus far prevented the recognition of this process as an available means of cure.

To prevent the injurious effects that follow its use, it has of late been recommended to conjoin compression of the artery, either above or below the sac, with the transmission of the galvanic current through it, there being in this way less liability for the deposited coagulum to be broken down and washed away, as would happen if the current of blood were permitted to pass

through the sac while it is in the process of formation. Of twenty-three cases thus treated, nine are reported as successful.

Injections.—Among the various modes of curing aneurism by the coagulation of blood in the sac, it has been recommended to inject certain substances into the tumor by means of a delicate trocar and canula, with which the sac is punctured; then fitting the nozzle of a syringe into the canula after the trocar is withdrawn, an injection of a solution of per chloride of iron is thrown into the sac. The piston is moved by a screw, each turn of which throws one drop into the sac. During the operation it is recommended that the artery be compressed above, and the tumor be gently manipulated, so as to cause the mingling of the blood and the perchloride as rapidly as possible. If this process succeeds, the tumor is converted into a solid mass, and a little serum only exudes from the puncture. This procedure has found little sympathy from the profession, and its employment seems to have been almost entirely abandoned.

Acupressure.—The process of passing a needle under an artery, as a means of arresting hemorrhage and effectually closing it, has already challenged the attention of surgeons, both in the old and new worlds, and bids fair to supersede the operation of tying arteries by the usual method. A description of this process is spoken of in vol. 1, page 163. The needle is passed so as to compress together and to close by its middle portion the tube of the artery, a short distance from the aneurism, on the cardiac side of the vessel. It is more simple of application than the ligature, and, if properly applied, of equal advantage in the cure of aneurism. Dr. W. T. Helmuth, of New York, employed the acupressure needle for a large erectile tumor, involving the upper part of the neck and lower jaw, the operation failing from unavoidable causes. Although but recently brought into notice, it has been employed with extraordinary success in amputation of the extremities, the removal of glandular enlargements, tumors, etc., and in one or two instances for the cure of traumatic aneurism. I have no doubt in the latter affection it will, to a very great extent, supersede the one of arterial ligation, employed in the ordinary manner, especially in those aneurisms where the artery can be separated from the adjoining vessels without the danger of being injured by the introduction of the needle.

PART XIV.

LIGATION OF ARTERIES.

CHAPTER I.

RULES TO BE OBSERVED IN THE LIGATION OF ARTERIES.

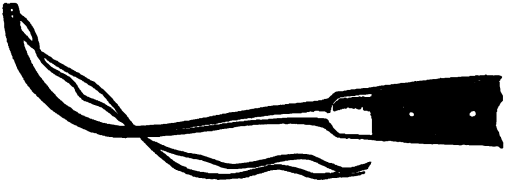
The accumulated experience of the profession in the application of the ligature to an artery, having established certain general rules as essential to the proper performance of the operation, it will be found useful to follow them in the application of every ligature. As the object to be attained in ligating a vessel is a direct change in the course of the normal circulation, these rules may be condensed into two general ones, viz: Always to expose the vessel without opening it, and to ligate it with as little disturbance to the surrounding parts as possible.

In order to carry out these rules, Lisfranc gives the following words of advice: "To make sure of the position of the artery, special anatomy furnishes every medical man with accurate information in regard to the ordinary position of the arteries; but as these vessels are liable to various anomalies and to irregular distribution, as well as to changes consequent upon disease, especial attention should be given to the position of the vessel upon each patient at the time of the operation. In seeking for the vessel, notice should be taken of the position of such muscles as usually indicate the course of the artery, or of those which have been termed 'muscles of reference,' so that by causing these muscles to contract and become prominent, the surgeon may

readily recognize any deviation of the artery from its natural relations with the parts; or, he may feel for the pulsations of the artery; or, if the tissues be too much thickened, or the vessel too deep for this, lines may be drawn from such fixed points of the skeleton as normal anatomy teaches us will cross or follow the usual course of the artery. After recognizing the position of the vessel, its exposure becomes the next point for consideration, and in order to prevent any variation from the proper line of incision, as well as to steady the skin, place the fingers of the left hand perpendicularly upon the skin, being careful not to draw it to one side while incising the integuments by sweeping the scalpel close along the edges of the nails." Malgaigne objects to this as likely to displace the integuments. When the artery is superficial, the incision through the integuments should be parallel with its course; but when deep-seated, an oblique incision, by affording a greater line for any variation that may exist, will add much to the facility with which the vessel may be found. When the aponeurosis of the part is directly in contact with the sheath of the vessel, it is generally safer to open the sheath on one side and then slit it up upon a director. On reaching the sheath of an artery, or the artery itself, the vessel may generally be known by its yellow or dull white color, by its pulsation and its becoming flattened when the circulation is interrupted between it and the heart. In order to isolate the artery with as little disturbance as possible to surrounding parts, the relative position of the adjacent veins and nerves should be recollected, and the adhesions of the sheath and other tissues only loosened sufficiently to permit the passage of the ligature. To do this a good aneurismal needle should be selected. When, in passing the needle, the point appears beneath any dense cellular structure, the latter should be supported by the finger to facilitate its perforation. Do not, at the commencement of the operation, occupy yourself with looking for the artery, but seek the first marked point of reference, then the next, and so until the vessel is reached. Mott, of New York, whose experience in ligating the large arteries has been greater than any other surgeon in the United States, advises that in every operation upon these vessels but little use should be made of the knife after the edge of the muscle of reference is laid bare, the

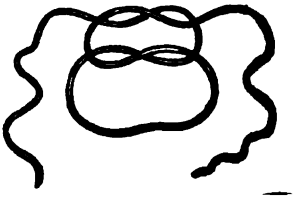
fingers, director, or handle of the scalpel being capable of separating these parts quite as readily as its edge, without exposing the surgeon to the troublesome oozing which is apt to ensue on division of the minute vessels. By following this rule, the main arteries can be more distinctly seen. In order to hold the cut tissues asunder, Mott employs curved spatulæ, and divides the sheath perpendicularly, and only upon the *front*, never using the blade upon the sides of the vessel, but with the knife-handle separates the structures only to such an extent as will permit the armed aneurismal needle to pass. He employed the Philadelphia needle (Fig. 251), and always introduced it so that the point would pass from the vein. In attempting the cure of aneurisms by ligature, surgeons generally resort to the method of Hunter, applying the ligature to the sound coats of the vessel at some distance above, or on the cardiac side of the tumor,—that of Brasdor, in which it is ligated on the distal side of the tumor, being seldom employed. The latter operation is also applicable only to cases in which no branch comes off from the artery between the ligature and the sac, as is often the case, or in those where there is no branch communicating with the sac itself.

Fig. 251.



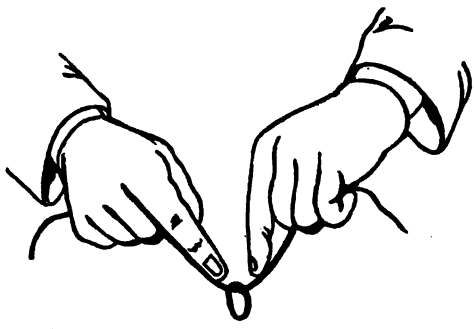
It is an important step in this operation that the knot be tied in such a manner as to *divide* the coats of the vessel, and not yield its hold of the artery in the slightest degree, as the patient's safety and success of the operation depends upon the degree of force applied, and firmness of the knot. In applying the ligature the following rules should be observed: 1st. Pass the end of the ligature held in the right hand *from* you, once around the corresponding end of the ligature held in the left hand, during which process the ends *change hands*; then 2nd. Pass the end of the ligature held in the right hand *towards* you once around the other end and the knot is tied. (Fig. 252.)

Fig. 252.



The manner of holding the ligature, especially in ligating the deep-seated arteries, in order that the knot may be drawn tightly and the vessel properly secured, is by making a fulcrum of both forefingers introduced within the wound pushed well down upon the vessel, as represented in Fig. 253.

Fig. 253.



The immediate effects of tightening the ligature is a cessation of pulsation and bruit in the tumor, and a partial subsidence of its size. The supply of blood to the limb being in a great measure cut off, it becomes numb and cold, with a diminution of muscular power. The more remote effects consist in an increase of the activity of the collateral circulation, by which the functions of the limb are maintained. As a consequence of this, the temperature of the limb often rises, until it becomes even higher than that of its fellow.

The consolidation of the aneurismal tumor is completed in a few days by changes that take place within it similar to those that occur in the spontaneous cure of the disease, by the gradual deposit of fibrin in concentric layers within the sac.

It is, however, especially applicable to aneurisms so seated as not to leave sufficient space between the tumor and the main trunk for the application of the Hunterian plan, as in aneurism at or near the innominata, or root of the right subclavian; in these, Brasdor's operation is very useful. In other cases the Hunterian plan is usually followed.

CHAPTER II.

OPERATIONS ON THE ARTERIES.*

LIGATION OF THE INNOMINATA OR BRACHIO-CEPHALIC.

The plan of Dr. Mott is the one, says Gross, best adapted for obtaining ready access to this artery, and is that which I should myself follow if called upon to secure the innominata in case of aneurism. The incision resembles, in outline, the shape of the letter L, the horizontal limb corresponding with the upper margin of the clavicle and sternum, and the vertical with the inner margin of the sterno-cleido-mastoid muscle, each being about three inches in length. The lower incision extends as far inwards as the center of the trachea. The triangular flap thus mapped out, embracing the skin and platysma-myoid, being dissected up, the sterno-cleido-mastoid, and sterno-thyroid are respectively separated, upon a director, from their inferior connection, and turned out of the way. A layer of the deep cervical fascia is now pinched up and divided, when the carotid will be brought into view a few lines above the top of the sternum, accompanied by the jugular vein and pneumogastric nerve. Taking this vessel as his guide, the surgeon can easily trace the course of the innominata down to the heart, and isolate it from its associate vein. The ligature, where the case admits of it, should be applied about the middle of the vessel, the needle being carried around it from left to right, and from behind forwards. In performing the operation it should be remembered that this artery is only about sixteen lines in length; that it rests upon the trachea; that it crosses somewhat obliquely at the base of the neck; that the middle thyroid vein, and sometimes the middle thyroid artery, run along its inner side, and that on the right side and on a plane anterior to it, is the innominata vein, the two vessels being intimately united by cellular substance, and in close relation behind with the pneumogastric and phrenic nerves, the latter laying

*From Gross's System of Surgery.

external to the former. The top of the pleura is a little inferior and external to the artery, and might, unless great caution is used, be easily wounded. The middle thyroid artery is sometimes given off by the innominata on its tracheal aspect, and should be looked for in isolating the vessel, as its division might be followed by annoying hemorrhage.

This artery was successfully tied by Dr. A. W. Smith, of New Orleans, in 1864; also, the right carotid for aneurism. Dr. Mott, the great American surgeon, of this operation said: I have expressed myself to my class for many years past that I would like to live long enough to see the innominata successfully tied for aneurism. For this surgical achievement I am more than gratified—*I am delighted*. On the brow of Dr. A. W. Smith, of New Orleans, will always rest the laurel of the first successful operation of ligature of this great artery. Time can never rob him of this surgical achievement.

LIGATION OF THE COMMON CAROTID.

The first operation performed for carotid aneurism was by Sir Astley Cooper, in 1805, and was unsuccessful, the case terminating fatally on the nineteenth day. Three years subsequently, he ligated the vessel again, and this time with success. There are two points at which the common carotid may be ligated, the place of election being regulated by the circumstances of the particular case. These are the upper and inferior cervical regions, and it will be well, in every instance before the operation is begun, to recall to mind the more important anatomical relations of the parts, otherwise serious blunders may arise, such for instance as tying the omo-hyoid muscle or the jugular vein instead of the artery, or including along with the artery the vessel named, or some important nerve, as the pneumogastric, sympathetic or laryngeal. As the artery proceeds upwards, it is overlapped by the sterno-mastoid, sterno-hyoid, and sterno-thyroid muscles, and crossed by the omo-hyoid towards its superior extremity. Running down in front of its sheath, is the descending branch of the ninth pair of nerves, a little thread-like filament, easily recognized by its whitish appearance, while within the sheath are, on the external side of the artery, the internal jugular vein, and behind

and between them the pneumogastric nerve; the sympathetic and recurrent nerves being on a plane posterior to the sheath. Their relations are intimate, therefore the utmost caution is necessary in isolating the parts, previous to the application of the ligature. The artery is occasionally overlapped by the jugular vein, which occasionally swells out enormously at each expiration, so as to obscure the vessel and render its ligation extremely difficult; this is remedied by requesting an assistant to compress the vein both at the upper and lower angle of the wound, the blood having previously been pressed out of it. The common carotid, on the right side, is sometimes absent, its place being supplied by two trunks which arise separately from the arch of the aorta, ascend along the neck, assuming the office of the internal and external carotid. When this arrangement exists, which is rare, the order of origin of the branches of the aorta is as follows: The right subclavian, right external carotid, right internal carotid, left common carotid and left subclavian. The common carotid may also bifurcate very low down, not reaching so high as the inferior border of the thyroid cartilage; and again, it may not separate into its terminal divisions until it reaches the angle of the jaw. Again, it may be crossed in front by the inferior thyroid artery and lie upon the vertebral artery, as this vessel passes along the spine, including in its sheath the descending branch of the ninth pair of nerves. In ligating the carotid, the patient should be in the recumbent posture, with the head inclined to the opposite side, and well supported by pillows, the shoulder being at the same time somewhat raised, in order to place the neck in the proper horizontal position. In the lower part of the neck the artery may be exposed by making an incision from two and a half to three inches in length along the inner border of the sterno-cleido-mastoid muscle, commencing just above the clavicle. The skin and platysma-myoid muscle being divided, a portion of the cervical fascia is pinched up and opened transversely to an extent large enough to admit a grooved director, upon which the membrane is then divided to near the extent of the outer incision. Two retractors are now placed in the wound, one being used to draw the sterno-cleido-mastoid muscle outwards, and the other to draw the sterno-thyroid inwards towards the trachea. The sheath of the artery being

now exposed, a small portion of it is raised and divided, the director being introduced, it is opened so as to denude the artery to a small extent, and enable the operator to isolate it from the jugular vein and pneumogastric nerve, the ligature being passed from without inwards. The small subcutaneous vein, which communicates with the facial vein, and the thyroid plexus, must be carefully avoided. The artery being more easy of access in the superior part of the neck than the inferior, this point should be always selected, if possible, for ligating it. To expose the artery in this position an incision should be made along the inner margin of the sterno-cleido-mastoid muscle, commencing a little below the cricoid cartilage, and reaching nearly as high up as the angle of the jaw, dividing the integuments, platysma-myoid muscle, and cervical fascia, the operator thus comes at once to the sheath of the vessel, which is then opened in the same cautious manner as in the previous case: and the artery being gently separated from the accompanying structures, is ligated by passing the needle from without inward, so as to exclude the jugular vein. The omo-hyoid muscle must be held aside with a hook. When access to the common carotid in the inferior part of the neck is rendered difficult on account of the low situation of the tumor, the best plan is to divide the sterno-hyoid and sterno-thyroid muscles either alone or jointly, with the inner portion of the sterno-mastoid, so as to enlarge the space between the aneurism and the sternum. By observing this precaution, Mr. Porter, of Dublin, was enabled to ligate the vessel successfully within an eighth of an inch of the innominata. The carotid is sometimes tied at a very early age. Dr. McClellan, assisted by Dr. Gross, ligated this artery in a child only five months old, on account of an immense nevus of the upper part of the face. The

Fig. 254.

nth pair of nerves was divided in this case, as it interfered with e passage of the ligature. No untoward symptoms occurred; e tumor diminished somewhat after the operation, but in less an a month was larger than ever.

Ligation of this vessel is occasionally required on account of unds of the neck, involving the external carotid or some of its anches. The operation is often embarrassing in consequence of e confused condition of the parts from the extravasation of ood, and it is not always successful, owing to the establishment a return current through the internal into the external carotid. ence, secondary hemorrhage is liable to ensue, necessitating fur- er proceeding, and that, perhaps, at a time when the wound is a high state of inflammation. In order to avoid this it has en proposed by Dr. Gurden Buck, of New York, to ligate sim- taneously the common and internal carotid arteries. Ulcers of e fauces have induced the ligation of the primitive carotid, as the cases reported by Luke, Mayo and Syme, in all of which e operation was successful. The common carotid has been ten ligated for wounds, epilepsy, erectile and other tumors, as ll as for restraining hemorrhage in operations upon and about e jaw, face and neck. In thirty cases in which the artery was d on account of wounds, fifteen recovered and fifteen died; in teen cases in which it was ligated previous to or at the time of tirpation of tumors of the jaw, face and neck, eight died; in cases in which it was tied for the cure of epilepsy, all recov- ed from the effects of the deligation, although in two, both ves- s were secured; in forty-two cases in which it was tied for the re of erectile tumors and other growths about the head, twenty re cured, thirteen died, and nine recovered from the effects of e operation without material benefit. In upwards of twenty of e ninety-four cases, more or less severe cerebral symptoms fol- ved the operation. Dr. James R. Wood, in 1857, published e details of thirty-nine cases in which the primitive carotid was cured by different surgeons of New York for various affections, th a loss of only six. The cause of death in two, was softening the brain, in one, inflammation of the jugular vein, in one, ricarditis with abscess of the lung and liver, and in one, haustion.

LIGATION OF THE EXTERNAL CAROTID AND ITS BRANCHES.

Ligation of the external carotid is seldom required for anything else than wounds and vascular growths about the face and head. The vessel is often opened in attempts at suicide, though less frequently than is generally imagined; for persons intent upon self-destruction usually bend the neck so far back as to place the artery beyond the reach of the knife. Some of its branches are commonly injured under such circumstances, especially the superior thyroid and lingual, and the hemorrhage thus produced may be promptly fatal. A ligature may be readily placed round the external carotid in the first part of its course, by carrying an incision, about two inches and a half in length, parallel to, but about six lines in front of the inner edge of the sterno-mastoid muscle, commencing opposite the middle of the thyroid cartilage and terminating a short distance below the angle of the jaw. The trunk of the common carotid will guide the finger to its external division. The incision should be made with great care, lest violence be done to some of the numerous branches of the vessel. The artery, as it lies beneath the digastric and stylo-hyoid, is exposed with difficulty, the incision must be proportionately large, and the muscles just mentioned must be well depressed with the retractor.

LIGATION OF THE SUPERIOR THYROID ARTERY.

This artery is much exposed to injury in attempts at suicide, and may then be traced by simply following the wound. If it becomes necessary to ligate it on account of hypertrophy of the thyroid gland, with a view to diminish the supply of blood to the part, an incision should be made about two inches in length across the upper part of the neck, obliquely downwards and outwards from the side of the hyoid bone, to the edge of the sterno-mastoid muscle. The skin, platysma-myoid and cervical aponeurosis having been carefully divided, the superior thyroid will be found deep in the omo-hyoid space, between the sheath of the carotid and the thyroid gland.

LIGATION OF THE LINGUAL ARTERY.

The lingual artery may be tied by making a transverse incision along the os hyoides, from a little below the symphysis of the jaw

near the border of the sterno-mastoid muscle. The skin, ysma and fascia being divided, the artery must be looked for g upon the greater cornu of the os hyoides, below the digas- muscle and ninth nerve. This artery has been tied in cases umor and wounds of the tongue; but considering the depth which it lies from the surface, the irregularity of its origin, the important parts in its vicinity, it is much better to tie the rnal or common carotid. When passing the needle behind artery, care must be taken to avoid the superior laryngeal ve, which descends nearly at right angles behind the artery.

LIGATION OF THE FACIAL ARTERY.

This artery is frequently concerned in operations about the x, face and lips, and may be easily compressed with the finger t passes over the jaw. When ligation becomes necessary an sion should be made through the skin and areolar tissue that er it where it turns over the jaw, at the anterior border of the sseter muscle, but such an operation is seldom required.

LIGATURE OF THE OCCIPITAL ARTERY.

This artery sometimes requires ligation on account of wounds. nay be exposed just above its origin by carrying an incision ng the inner border of the sterno-mastoid muscle, in the angle ned by it and the digastric, the latter of which must be well wn down. The hypoglossal nerve hooks around it at this nt, as it passes forward to its destination. The artery for the ater part of its course is superficial, its course beneath the p being indicated by its pulsation.

LIGATURE OF THE TEMPORAL ARTERY.

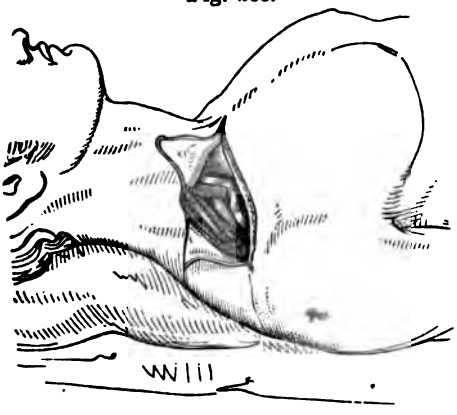
This artery may be secured immediately above the zygoma, by hort vertical incision, embracing the temporal aponeurosis, nediately beneath which it is situated. Should the artery be nded in its lower portion, the best plan is to ligate the external otid, for in the lower part, owing to the depth at which the sel lies, the attempt at ligation is unjustifiable.

LIGATION OF THE SUBCLAVIAN ARTERY.

The point usually selected for tying this artery, is in that por-

tion considered as the third course of the vessel. This portion is about an inch and a quarter long, and passes from the scaleni muscles downwards to the lower border of the first rib, where it takes the name of axillary. Its depth depends on the bend of the clavicle, the length of the neck, and position of the shoulders. It lies on the scalenus medius and the upper surface of the rib. In front are the skin, platysma, supraclavicular nerves and vessels, cervical fascia and a portion of areolar tissue. The subclavian vein is on a plane anterior but inferior, and is nearly concealed by the clavicle. It is here joined by the external jugular, the posterior scapular, and other small veins, sometimes forming a large and intricate plexus. The brachial nerves are above and behind the artery. The artery may be irregular and either perforate the anterior scalenus muscle or lie in front of it, close to the subclavian vein. On the right side the artery may come from the back part of the innominata. Both subclavians may rise higher in the neck, an inch or more above their usual position, which is a little above the clavicle. Before commencing the operation the patient should be placed upon a table, in the horizontal position, with the shoulder of the affected side drawn down, and the face slightly turned to the sound side. An incision is then made above and parallel with the clavicle, three or four inches in length, commencing at the outer edge of the sterno-mastoid and extending to the margin of the trapezius, cutting through the skin and platysma, as seen in Fig. 255. The external jugular vein being now exposed, should be held out of the way with a blunt hook. If the clavicular portion of the mastoid muscle is unusually broad, it should be severed, so as to facilitate the operation. The cervical fascia is now divided very carefully. The omo-hyoid muscle is sought for and

Fig. 255.



drawn up, and here in the space bounded externally by this muscle, anteriorly by the sterno-mastoid, and below by the clavicle, are the artery and brachial plexus of nerves. The supra-scapular, and even the transversalis colli arteries may be met with, and must be drawn aside. The anterior scalenus muscle, the chief landmark, should now be searched for, and traced to its insertion in the rib, a little to the outside of which the artery will be found pulsating, and where it may be secured by passing the needle from before backwards and from below upwards. Venous hemorrhage should be overcome either by pressure or the ligature. If the subclavian vein is wounded, pressure alone can be employed. The surgeon will oftentimes experience great difficulties in passing the needle under the artery, and previous to tightening the ligature it should be ascertained that no portion of the axillary plexus of nerves is included.*

LIGATION OF THE VERTEBRAL ARTERY

Is sometimes necessary on account of wounds of the neck. When such a proceeding becomes necessary, the artery may be found just below the transverse process of the sixth cervical vertebra, about two inches above the clavicle, and at the inner side of the scalenus anticus muscle. Maisonneuve tied successfully the vertebral artery, together with the inferior thyroid, below the sixth cervical vertebra, on account of a gunshot wound. The incision was carried along the anterior edge of the sterno-cleido-mastoid muscle, exposing the sheath of the common carotid artery, which was held aside while he denuded and severed the injured arteries. Hippolito related two cases in which this vessel was successfully ligated at its origin.

LIGATION OF THE INTERNAL MAMMARY

Is rendered necessary from gunshot injuries, or from cases of injury from fracture of the sternum or ribs. The artery with its veins will be found in the first part of its course about three lines

*The *right subclavian artery*, in the first portion of its course, that is to say between its origin from the innominata and the scalenus muscle, has been tied for aneurism, but the operation is so difficult, and at the same time so unsuccessful, that it has been almost altogether abandoned by the profession.

from the edge of the sternum, in front of the triangular muscle which separates it from the pleura. It may readily be reached in the three upper intercostal spaces, by a vertical incision carried through the integuments and internal intercostal muscles. Below these points the operation is performed with difficulty, on account of the narrowness of the intercostal spaces.

LIGATION OF THE INFERIOR THYROID.

This artery in the first part of its course, ascending upwards and inwards, passes behind the great vessels and nerves of the neck. It may be exposed by making an incision along the inner border of the sterno-cleido-mastoid muscle as in the operation for tying the carotid, the sheath of which should be drawn carefully upwards. The artery will be found to cross over to the thyroid gland, opposite to the fifth cervical vertebra, and may be secured at this point. Care must be taken that no injury be done to important vessels and nerves in this region.

LIGATION OF THE AXILLARY ARTERY.

The axillary artery is that portion of the main trunk of the arm which extends from the lower border of the first rib to the lower edge of the tendons of the latissimus dorsi and teres major in the axilla. Its entire course is that of a gentle curve with the convexity upwards and outwards. For surgical purposes it is divided into two portions, the inaccessible and accessible. The inaccessible or upper portion is thickly covered by muscles, and lies deep. The accessible is that portion where it can be felt against the humerus, in the axilla. It is only in cases of wounds that the artery is tied in the upper portion. In aneurism affecting this vessel, the subclavian should be tied above the clavicle. The ligation of this artery was first performed by Chamberlayne, in 1815. The operation can be performed just below the clavicle, but is generally done in the hollow of the axilla.

Ligation below the Clavicle.—The patient being placed in a half-sitting posture, with the arm slightly abducted, an incision is made along the inferior border of the clavicle, through the skin and platysma, from near the sternum to within a short distance of the deltoid muscle, care being taken to avoid the cephalic vein.

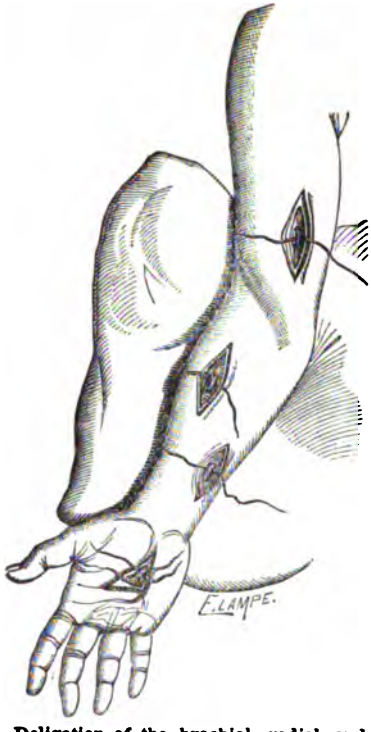
ysma-myoid and great pectoral muscles being divided to extent of the external wound, the small pectoral should ed by bringing the arm close to the trunk, a retractor , and the divided structures well depressed; the artery r be found a little below the clavicle, inclosed in dense hich must be carefully scratched through, when the vessel brought to view. The accompanying vein, which often ut suddenly during expiration, lies below and in front of the brachial plexus is behind, except one of its branches above and in contact with it. The anterior thoracic artery n its anterior surface. The needle should be passed from outwards in order to exclude the vein.

tion in the Axilla.—The patient being placed in the osition as in the preceding operation, the arm forcibly d and supinated, an incision about three inches in length through the skin and areolar tissue over and parallel with er extremity of the humerus, between the pectoralis major ssimus dorsi, a little nearer the latter. The fascia is now nd divided in the same direction as the external incision. ves and vessels being now reached, the arm is lowered and nective tissue divided by the director. The vein and nerve being now exposed, by cautiously separating them e finger-nail, handle of scalpel or director, the artery may ght to view and tied, the ligature being passed from within ds. Care should be taken that the thoracic and subscapu- s be not wounded in the isolation of the artery.

LIGATION OF THE BRACHIAL.

brachial artery requires to be ligated more frequently than er artery in the body. Its whole course is comparatively ial, so that its pulsations may be felt in the greater por- its extent. It may be secured near its origin, by making ion about two inches in length along the inner margin of aco-brachial muscle, taking care not to divide the internal us nerve, the arm at the time being extended and supina- ext, divide the fascia, and the artery will be felt lying n the median and ulna nerves, the median on the outer side ulna on the inner. The basilic vein will generally be

Fig. 256.



Deligation of the brachial, radial, and ulnar arteries; also of the palmar vessels.

found to lie on the inner side of the artery. Now the fore-arm should be bent so as to relax the parts, and the coraco-brachialis be drawn outward. Any veins or arteries in the way may be held aside with a blunt hook, the sheath of the artery opened, and the median nerve drawn outwards. The surgeon will now pass the needle in what-ever direction most convenient for avoiding the veins. The best guide to the seat of the artery, in the middle portion of the arm, will be the ulna edge of the biceps flexor muscle. The median nerve at this point is usually inside and front of the vessel. At the bend of the arm, the artery is exposed by an incision in the line of the ulna border of the tendon of the two-headed flexor muscle. It is not necessary in these operations to divide any muscular fibres. It should be borne in mind that the brachial may, early in its course, divide into the radial and ulna, which on reaching the elbow, may pursue their usual course, or either one of them may proceed superficially down the arm while the other becomes deep-seated.

LIGATION OF THE RADIAL AND ULNA ARTERIES.

The radial may be tied near its origin, at its middle, and at its inferior extremity. When ligated at its origin, an incision about three inches in length, is made, parallel to the inner border of the long supinator muscle, between which and the round pronator the artery may be found, together with its two veins, the radial branch of the musculo-spiral nerve lying at its outer side and some dis-

ce from it. In the middle third the vessel lies between the g supinator and flexor muscles of the carpus, the spiral nerve ng close along its radial border. The inferior portion is com- ratively superficial. In fact, throughout nearly its whole ent, its pulsations will serve as a guide to its course.

When the ulna requires ligating from injury in the upper por- n of its extent, the wound "enlarged, if necessary" will serve a guide to the vessel which should be tied at each extremity, is guarding against hemorrhage from the recurrent circulation. the middle of the limb the vessel lies along the radial border of ulnar flexor of the carpus. The ulna nerve here lies on the er side of the vessel. Near the wrist the situation of the ery is indicated by its pulsation. Fig. 256.

LIGATION OF THE ABDOMINAL AORTA ARTERY,

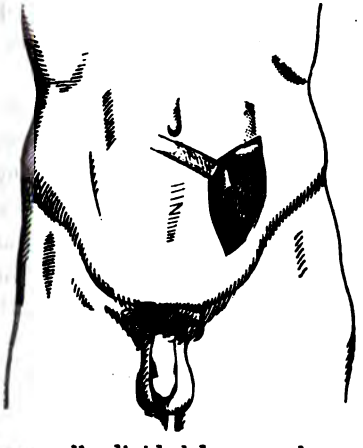
nen performed on account of wounds, is best done by enlarging opening already made to an extent sufficient to admit the passing the ligature. When performed for aneurism, the patient lying the right side, a curvilinear incision, six inches in length, with convexity towards the vertebræ, should be made through the eguments, from an inch above the anterior spinous process of ilium to the cartilage of the tenth rib. The underlying uctures are now carefully divided until the peritoneum is ought into view, which is cautiously peeled off from the iliac d psoas muscles, with the fingers, a short distance beyond the ntemplated point of ligation, care being taken not to injure it. e aorta being now separated from its accompanying vein on right side and filaments of the sympathetic nerve in front, ligature is passed round the artery from left to right, and m behind forwards, about an inch above its bifurcation into common iliacs. This process is best effected with a long rector, slightly sharp at its extremity, and the nail of the index ger as a guide.

LIGATION OF THE COMMON ILIAC ARTERY

as first performed by Dr. William Gibson, in 1812, in a case gunshot wound. The patient died in thirteen days from peri- neal inflammation and hemorrhage. It was first tied for aneur-

ism by Dr. Mott, in 1827. The disease occupied the external iliac artery; the ligature came away on the nineteenth day, and in less than two months the man was entirely well. This artery has been ligated since then over twenty times. The common iliac extends from the bifurcation of the aorta, at or near the body of the fourth lumbar vertebra, to the sacro-iliac synchondrosis, and is usually about two inches in length. It is covered by the peritoneum, and crossed near its bifurcation by the ureter. Each common iliac is in close relation with its vein; both right and left common iliac veins pass behind the right iliac artery to reach the cava, and the artery is closely connected to them both. By this arrangement the left common iliac artery has a small space between it and its vein which lies internal to it. The superior hemorrhoidal and rectum arteries cross the left common iliac artery.

Fig. 257.



The patient lying upon his back with the thighs slightly relaxed, a curvilinear incision, from five to seven inches in length, is made through the skin and superficial fascia, along the lower part of the abdomen, half an inch above Poupart's ligament, extending from the external ring upwards and outwards a little beyond the anterior superior spinous process of the ilium. The intervening structures are now carefully and severally divided down to the peritoneum. The intestines, as soon as this transversalis fascia is divided, will protrude into the wound and annoy the surgeon; they should be drawn upwards with the greatest gentleness, when the peritoneum may be gently detached from the surrounding structures, by means of the finger, as high up as the case may demand. The artery being now exposed, is isolated from the vein which accompanies it, and the ligature passed from within outwards, above the middle of the artery. Care must be taken not to wound the spermatic cord.

LIGATION OF THE INTERNAL ILIAC ARTERY

first performed by Dr. Stevens, of Santa Cruz, in 1812, for
posed aneurism of the gluteal artery. It has been performed
l about nine times, half of which have proved successful. The
ner of exposing the artery is the same as in ligating the com-
iliac. The operation described for tying that artery is the
most easy of access and possesses the additional advantage of
ling the surgeon to tie the common trunk in case it should be
ssary. In ligating the artery too much tension should not be
e upon the vessel lest the ileo-lumbar artery should be torn.
fascia of the artery is scraped away with the handle of the
el, and the external iliac vein, which lies between the external
internal iliac arteries being avoided, the ligature is passed
within outwards. After ligation the circulation is carried on
ly by the lumbar and sacro-lateral branches. When the artery
ry short, or the pelvis unusually small, rendering the ligation
ult, it is better to ligate the common iliac, as it would be
ded with less violence to the parts, and less risk of peritoni-
r hemorrhage. The most common cause of death after the
ation is secondary hemorrhage.

LIGATION OF THE GLUTEAL ARTERY.

his artery often requires ligating on account of wounds, and
matic aneurism. In exposing the vessel an incision is made
e direction of a line extending from the posterior superior
ous process of the ilium to a point midway between the tuber-
of the ischium and the great trochanter; it should be at
eight inches in length, and should be carried down into the
rismal sac at one stroke, its contents turned out and the
y instantly secured, as it lies towards the upper part of the
nd. The operation is both bloody and formidable, and demands
, nerve and expedition. In case of traumatic aneurism of
artery it is advised to ligate the internal iliac. In exposing
vessel for the relief of hemorrhage, the surgeon is compelled
ke the external wound for his guide, enlarging it, if necessary,
e direction of the muscular fibres, especially if the artery divide
emerges from the sacro-sciatic notch. In ligating the ves-
t should be remembered that it is accompanied with a nerve

and vein, which should be excluded from the ligature. Prof. Campbell, of Montreal, in case of aneurism, in 1862, secured this vessel at the upper and anterior portion of the sciatic notch, without opening the tumor; some difficulty was experienced in passing the ligature, but as soon as it was tied, all pulsation in the sac stopped, and the recovery was rapid.

LIGATION OF THE SCIATIC ARTERY.

This artery may be exposed by making an incision, similar to that in the preceding operation, but an inch and a quarter lower down. Dr. Dugas, of Georgia, secured this artery for an aneurism of its own trunk; but, on account of secondary hemorrhage, caused by the patient's imprudence, it became necessary to secure the common iliac at the end of a week. Death, from exhaustion, occurred four days afterwards.

LIGATION OF THE EXTERNAL ILIAC ARTERY

Was first performed by Mr. Abernethy in 1796, for aneurism of the femoral artery. The operation failed, and it was not until 1806, after two other attempts, that his efforts were successful. It was first performed in this country by Dr. Dorsey, in 1811, in a case of inguinal aneurism. The artery may be exposed by making a curvilinear incision through skin and superficial fascia down to the tendon of the external oblique, from three to four inches in extent, with the convexity downwards, commencing an inch and a half above Poupart's ligament, just outside of the external ring, and terminating on a level with, and about two inches on the inner side of the anterior superior spine of the ilium. In case of dividing the external epigastric artery, it must be tied immediately. The aponeurosis of the external oblique should be divided upon the director, then the muscle and the over-lying structures, until the transversalis fascia is reached, which will be recognized by its opaque, whitish appearance; a small hole being scratched through it with the nail or scalpel, it is slit open to the extent of the external wound. The peritoneum now being cautiously detached from its connections in the iliac fossa, the artery may be felt pulsating at the bottom of the wound, in close connection with the femoral nerve and the iliac vein, having the ante-

rural nerve at its outer side and on a plane deeper than the , and the iliac vein behind and internal to it. The sheath be scratched through with the finger-nail or a director, at oint selected and the artery separated from the vein. The ism needle should be passed between them from its inner the genito-crural nerve being excluded from the ligature. vound should be brought together by sutures, by carrying eedle well down to the bottom of the wound, the trunk bent rds so as to relax the muscles, and pressure applied by means oller and compress. *Staphysagria* lotions should be applied ally, and the wound treated as recommended in Incised ds. The artery should be tied as near its middle as possi- he better to guard against secondary hemorrhage which not quently occurs from the fifth to the fortieth day.

LIGATION OF THE EPIGASTRIC ARTERY

ily performed by making an incision about two inches in just above and parallel to Poupart's ligament in a line cor- nding with its center. The parts are then carefully divided the artery is reached, where it lies, between the transversalis and peritoneum. Its accompanying veins should be care- excluded from the ligature. When this artery is divided to the external iliac, the latter vessel should be ligated d of the epigastric. The artery arises on the inner side of ternal iliac, about three lines above Poupart's ligament and ds inwards close to the inner border of the internal ring the vas deferens hooks around it as it enters the abdomen.

LIGATION OF THE CIRCUMFLEX ILIAC ARTERY.

s artery, given off by the external iliac a little lower than igastric, is sometimes wounded, and may be secured in the art of its course, in nearly the same manner as the epigas- he incision being made close to, and parallel with Poupart's ent, its center being opposite the internal ring. Farther may be exposed by dividing the tendon of the external e muscle within half an inch of the margin of the ilium, it is firmly attached and held down by the transverse fascia.

LIGATION OF THE FEMORAL ARTERY.

The common femoral being perfectly superficial from its origin, on a level with Poupart's ligament to two inches below, is easily exposed by an incision about two inches in length, the operator being guided by its pulsation. The femoral vein lies on the inside of the vessel, within the same sheath, and must be separated from it with great care before passing the ligature. The superficial femoral artery may be ligated, either at its superior or middle portion; the former is, however, the more eligible, as the artery, in this part of its course, is more superficial, and easy of access. It lies immediately below the skin and aponeurosis, and may be exposed, by an incision about three inches in length, along the inner border of the sartorius muscle, beginning about two inches and a half below Poupart's ligament and extending obliquely downwards to the apex of the triangle formed by the convergence of the sartorius and adductor muscles. The femoral vein, inclosed in the same sheath, runs along the inner border of the artery, and is held together by a firm and intimate connection, the femoral nerve lying on the outside of the artery. With a forceps, pinch up a portion of the aponeurosis and make an opening into it large enough to admit the end of a director, upon which the sheath of the vessel is cautiously divided and the artery carefully separated from the vein and the ligature passed from within outwards, hugging closely the walls of the artery. Injury to the vein would be a very serious accident and liable to be followed by fatal pyemia. Division of the vein will be known by a gush of black blood, which can be readily arrested, however, by pressure. In case of injury to the vein, it must, on no account, be tied. Occasionally a small twig of nerve runs down in front of the artery, which must not be included within the ligature. The best way of avoiding this accident of injury to the vein is by the use of a blunt hook, stiff enough not to bend, and while passing it from the inner side, to make tense the inner cut edge of the sheath with forceps. If inflammation has previously taken place, with infiltration or thickening of the sheath, greater caution will be necessary in its ligation. In popliteal aneurism, the better plan is to tie the artery, as it has the advantage of being far enough from the aneurism to

althy and low enough to avoid the profunda. In its middle
e, the artery is deep-seated, and lies under cover of the sarto-
nuscle. To expose it an incision should be made along the
edge of the sartorius, which is then turned to one side, so
afford free access to the vessel, as it lies beneath the apon-
is.

all operations upon the femoral artery, Mott advises the sur-
always to open the sheath of the vessel in front, and never
e the edge of the knife near the side of the artery, or within
eath, lest he wound some of the branches which generally
ven off from its sides. It should not be forgotten that certain
alies take place in reference to the femoral artery. These
t in the high division of the artery into two branches, which
form the peroneal and posterior tibial, and a double femoral,
upernumerary one giving off the branches usually furnished
e profunda. *Compression* of the femoral artery may be
sary for poplititeal aneurism, and the point selected is the
part of the thigh, just below Poupart's ligament, where the
may be pressed against the shaft of the femur in a direction
wards and outwards. The pressure should be made at alter-
points, as recommended under the head of Aneurism, page

LIGATION OF THE DEEP FEMORAL ARTERY,

required from injury of the vessel, the wound will serve as
le to the operator; in that event two ligatures will be neces-
o effectually stop the hemorrhage. In the case of aneurism
tery may be exposed by an incision similar to that made in
g the superficial femoral at its superior portion, beginning
h below Poupart's ligament and descending obliquely along
ner border of the sartorius muscle. The deep trunk may be
to the requisite extent, and should be tied a little below
igin of its two circumflex branches.

LIGATION OF THE POPLITEAL ARTERY.

en this operation becomes necessary it is usually performed
he upper and lower thirds of the vessel. The middle por-
rom its depth and nearness to the knee-joint, is seldom

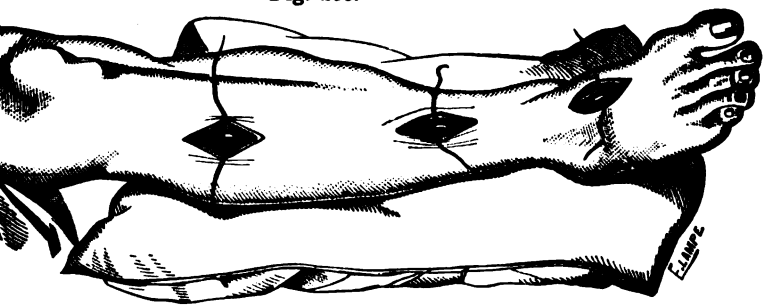
interfered with. When the operation is performed at the upper third, the vessel is exposed by a vertical incision about three inches in length, along the outer border of the semi-membranous muscle, down as far as the popliteal nerve. The muscle and nerve being drawn aside, the muscle inwards and the nerve outwards, the vein and artery will be easily found, and must be gently and cautiously separated from each other, and the needle passed from without inwards. To expose the artery in the lower third of its extent a vertical incision should be made between the heads of the gastrocnemius muscle. The posterior saphenus vein and nerve, together with the popliteal nerve, must be drawn to one side so as not to be injured by the knife. The artery will be found deeply imbedded in the ham, partially concealed by the vein of the same name, but projecting somewhat to its outer side. Care must be exercised in this operation, lest some of the articular branches be injured. This operation is rarely performed.

LIGATION OF THE ANTERIOR TIBIAL ARTERY,

In consequence of hemorrhage, or traumatic aneurism, may be performed at three points, the superior, middle and inferior third. The course of the vessel is indicated by a line drawn from the head of the fibula to the base of the great toe. The superior third of the vessel is exposed by an incision four inches in length carried downwards in the direction of the line indicated, and between the anterior tibial and common extensor muscles. The skin and superficial fascia being divided, the aponeurosis is raised and slit open upon a director; the two muscles are then separated from each other along their raphe, and the vessel is ligated in such a manner as not to injure the accompanying veins. In the middle portion of its course the relations of the vessel are the same as in the upper, except that the long extensor of the toe is interposed between the anterior tibial and common extensor. The vessel is still deep-seated, and a long incision is necessary for its full exposure. A branch of the peroneal nerve is sometimes attached to the artery in this portion, and must be drawn to one side before passing the ligature. (Fig. 258.)

In the inferior third of the limb, the artery lies on the tibia, between the tendons of the common extensor of the foot and the

Fig. 258.



gature of the anterior tibial, at various parts. The wounds are supposed to be held asunder. The ligature is under the vessel.

ng extensor of the great toe, the latter overlapping it on the side. The vessel is, therefore, easy of access.

The Dorsal Artery of the foot, a continuation of the tibial, ns down across the instep, its course being indicated by a line ttending from the centre of the ankle-joint to the posterior xtremity of the first interosseous space. It lies under cover of e integuments and aponeurosis, and may be exposed by an inci- on along the outer border of the tendon of the long extensor uscle of the great toe.

LIGATION OF THE POSTERIOR TIBIAL ARTERY,

occasionally performed on account of wounds, and in the upper rtion of its course is one of the most perplexing and trouble- me operations that the surgeon is called upon to perform, in nsequence of the amount of extravasated blood and the con- sed condition of the parts that necessarily follows from the depth the vessel, and thickness of the overlying structures.

The course of this artery, at first obliquely inwards and then rtical, is indicated by a line drawn from the inferior border of e popliteal muscle to the fossa between the os calcis and the inner kle. In the superior two-thirds, it is deep-seated, but dur- g the remainder of its extent it is superficial, lying directly below e integuments. It is accompanied in its course by two veins, ne on each side of it.

In its upper and middle portion the artery is best secured by e operation originally suggested by Mr. Guthrie. A long verti-

cal incision about four inches in length is made, extending through the center of the muscles of the calf, directly down upon the artery. The hemorrhage is generally insignificant, the artery is completely under control of the operator, and there is much less danger of bagging if blood and pus exist, than in any other operation. For ligating the vessel at the lower third of its extent, between the ankle and heel, the surgeon, guided by its pulsations, makes a curvilinear incision about two inches in length, midway between the points indicated, with the concavity towards the inner malleolus. The artery lies beneath these aponeurotic layers, which, being carefully divided upon the director, the ligature is passed from behind forwards, care being taken not to include the vein and nerve. The two *Plantar Arteries* beginning opposite the two heads of the adductor muscle of the great toe, are deep-seated, and exceedingly difficult to tie on account of hemorrhage from the anastomosing branches. No rules can be laid down for ligating the plantar arteries, and when such an operation becomes necessary from injury, the surgeon must take the external wound for his guide, enlarging the opening when required, in the direction of the length of the foot.

LIGATION OF THE PERONEAL ARTERY.

Oftentimes the trunk of this artery is absent, its place being supplied by branches from the popliteal; on the other hand it is very large at the lower part of the leg, and supplies the place of the posterior tibial. In the upper portion of its extent it may be exposed by a long and vertical incision, about four inches in length, almost in the centre of the leg, through the bellies of the gastrocnemius and soleus muscles. In the lower portion of its course it lies between the external malleolus and tendo-Achilles, and may be reached by an incision about two and a half inches in length, directed upwards and outwards towards the fibula. At this point the vessel is found lying upon the interosseous ligament under cover of the long flexor of the great toe, which must be detached as far as necessary from the bone and drawn outwards. This process may be facilitated by flexing the toe to the utmost, so as to relax the muscle and facilitate the separation of its fibres.

PART XV.

DISLOCATIONS OR LUXATIONS.

CHAPTER I.

GENERAL CONSIDERATIONS.

A Dislocation, or Luxation, is the partial or complete displacement of the articular surfaces of the bones entering into the formation of a joint.

Varieties.—Luxations are primarily classified as, 1. Accidental or Traumatic, including those in which the displacement is caused by the application of external violence, or by muscular action; 2. Spontaneous, or Pathologic, those occurring slowly, in consequence of disease; and, 3. Congenital, embracing those observed at or soon after birth.

For convenience of study, a further classification has been adopted according to the *position* which the displaced bone assumes, and are hence described as *Complete*, *Incomplete*, *Primitive*, and *Consecutive*, according to the amount of injury sustained by the surrounding tissues; they are also designated as *Simple*, *Compound* and *Complicated*; and according to the duration of the injury, are divided into *Recent* and *Old*.

1. **A Complete** luxation is one in which the articular extremities of the bone are entirely separated from each other.

2. **An Incomplete, Partial, or Subluxation,** is one in which the articular surfaces remain partially in contact.

3. **A Primitive** luxation is one in which the bone remains in the position in which it was originally thrown; while in the

4. **Consecutive, or Secondary** luxation, the bone, in consequence of muscular action, or unsuccessful attempts at reduction, is changed so as to occupy some new position.

5. By **Simple** luxation is understood one in which there is, comparatively, but little injury done to the adjacent soft parts.

6. In **Compound** luxation, a wound communicates with the joint.

7. A **Complicated** luxation includes some other injury in addition to the loss of the normal position of the bones, as, for example, a fracture, or extensive laceration of important blood-vessels, ligaments, muscles or nerves.

8. A **Recent** luxation is one that has occurred within a few days or weeks, or more properly, one which is capable of being successfully reduced, whatever the time, while

9. An **Old** luxation is to be regarded as one that has existed for so long a time as to prevent the bones from being placed in their natural relations.

Seat.—Nearly all the joints are subject to dislocation. Those, however, admitting of varied and extensive motion, as the ball and socket joints, are far more liable to it than any of the other articulations, while in some of the synchondroses it never occurs. The shoulder, in consequence of its peculiar structure, the glenoid cavity being exceedingly shallow, the capsular ligament long, and the surrounding muscles numerous and powerful, while the joint admits of the greatest freedom of motion, is, as we would expect, the most frequent seat of this variety of injury. And, indeed, according to the table of Malgaigne, it appears that luxation occurs here more frequently than in all of the other articulations combined. Thus, out of 481 cases, 321 were observed in this joint, 34 in the hip, 33 in the clavicle, 26 in the elbow, 20 in the foot, the remaining 47 occurring in the thumb, wrist and jaw. It also appears from the investigations of the same author, that they occur most frequently between the thirtieth and sixty-fifth year, being rarely met with under five years of age, or subsequent to the eightieth year.

Causes.—The principal *predisposing* causes of dislocation include freedom of motion of the joints, relaxation of the ligaments, disease of the extremities of the bones, paralysis, or atrophy of

e surrounding muscles, exposure of the joint, its anatomical ucture, and the peculiar function of the bones entering into eir formation. Age may also be said to exert an influence, ile, also, those persons of feeble constitutions, with their mus-lar systems much reduced, are particularly liable to suffer this cident. The exciting causes are mechanical violence and mus-lar contraction. The former may operate either directly or directly. Thus, for example, dislocation of the humerus may cur from the application of direct violence, exerted by a blow, fall upon the shoulder; the hip, or the patella, may also become splaced in consequence of force applied in like manner. More mmonly, however, the accident is observed as a result of indi-ct violence, as when the wrist, elbow or shoulder becomes lux-ed from a fall upon the hand, or the hip, from force applied at e knee.

Muscular contraction, dependent either on disease, spasmodic ction, or voluntary effort, may become sufficiently powerful to ecasion spontaneous, or pathologic luxation; such a result being metimes met with, in the first instance, in consequence of chronic heumatism, or of coxalgia; secondly, from convulsions; and, stly, from violent action, as in hurling a weight. It is further be observed, however, that some persons have the ability to uxate particular joints with the greatest facility by simple volun-ry action; while in all cases of this accident it is evident that uscular contraction plays a more important part. Thus, a man a state of intoxication, owing to the relaxed condition of his uscular system, rarely suffers dislocation of any of the joints, hile a force capable of producing this result almost invariably a live subject, will be found wholly incompetent to effect a lux-tion in the cadaver.

General Symptoms.—The symptoms attending dislocations re generally so well marked as to enable the surgeon to detect, ithout difficulty, the true nature of the injury. The more con-tant and characteristic of the phenomena presented are, the imme-iate loss of function, deformity, and change in the length and xis of the limb.

Loss of function of the joint is an inevitable consequence of islocation, and necessarily continues, more or less complete, until

reduction of the displaced bone is fully accomplished. In case of luxation of the joints of the superior extremity, for example, it will be found that the patient is unable perfectly to execute the motions peculiar to the limb, as flexion, extension, pronation, supination and circumduction, while in some instances motion is completely destroyed; and hence immobility of the affected articulation, becomes a very prominent and valuable symptom.

Deformity, occasioned by the new position assumed by the displaced bone, is a constant and most reliable symptom of dislocation. This is frequently so great as readily to be detected by the eye, the superimposed structures being raised into a distinct prominence, or in other cases, as in the luxation of the humerus, the articulation presents a marked flattened appearance. Provided, however, the displacement be slight, or the tumefaction so great as to obscure the deformity, careful manipulation of the parts will disclose the true position of the bone.

The *length and axis* of the limb are subject to marked change, and also afford valuable symptoms in determining the nature of the injury. The affected limb may be either increased or diminished in length, though shortening is by far more frequent than elongation.

The *axis* of the limb being almost invariably changed, often gives the parts a rigid and peculiarly unnatural appearance, which is often alone quite sufficient to indicate the true character of the injury. This is especially the case in dislocations implicating the elbow, and in the downward luxation of the head of the humerus. There are other symptoms, such as pain, numbness, swelling, contusion and discoloration, together with the presence of *moist crepitus*, exhibited after the occurrence of inflammation, which may be regarded as valuable in conjunction with the evidence afforded by the more prominent symptoms just mentioned.

Diagnosis.—There are a variety of affections with which dislocations are liable to be confounded, as *sprains*, *fractures*, *displacement of the articular cartilage*, *laceration of the ligaments*, and *chronic diseases of the joints*. Of these, however, fracture in the vicinity of the joints is, without doubt, the most frequently confounded with luxation, and, hence, the differential diagnosis concerning these injuries merits the closest study.

Differential Symptoms between Dislocation and Fracture.—Dislocations are characterized by loss of function, deformity, impaired motion, difficulty of reduction, pain, swelling and contusion, while in fractures there are impairment of function, distortion, preternatural mobility, crepitus, facility of reduction, together with pain, swelling and contusion. It will now be observed, by comparison of the symptoms, that many of them are possessed in common by the two injuries, and are consequently of no value whatever as diagnostic symptoms. For example, loss of function is quite as frequent in one as in the other, and, generally, as complete, while the deformity, pain, swelling, contusion and discoloration, as exhibited in each, present nothing characteristic by which a correct diagnosis can be determined.

The existence of crepitus, preternatural mobility and facility of reduction, however, as almost invariable attendants of fracture, include the differential signs by which the distinction between fractures and dislocations is made.

1. The *preternatural mobility* consequent upon fracture, by means of which the limb can be flexed, extended and moved about in various directions, never exists in case of luxation; the mobility of the limb, in the latter instance, being wholly lost, or, at least, greatly restricted. The dislocated bone also will be found to occupy a certain position, common to all luxations of a similar character. In case of fracture, also, the displaced member can readily be returned to its normal position, but when reduced will not remain in place without the application of external support, whereas in luxation, the replacement of the bone, frequently requires the most skillful manipulation, but, after its reduction has been effected, is rarely dependent upon external support to hold it in position.

2. The existence of *crepitus* affords one of the most important and characteristic signs of fracture, and is never present in any case of uncomplicated dislocation. Hence, if true crepitus be present in any instance, whatever the character of the concomitant symptoms, the case is evidently one of fracture. But, notwithstanding crepitus never exists independent of fracture, still all accidents of this nature, are not necessarily accompanied by a sensation of crepitus, however carefully the manipulation may be

conducted; although it is almost invariably present and can generally be detected without difficulty. The only symptom simulating it in luxations is what has been termed *moist crepitus*, which consists in a kind of rasping or friction sound, sometimes observed on the second or third day after dislocation, produced, undoubtedly, in consequence of fibrinous effusions.

3. *The facility of reduction*, as observed in ordinary cases of fracture, affords another valuable symptom by which the two affections can be distinguished. While in fracture, simple extension and counter-extension, exerted in the line of the axis of the limb, sufficient to make it assume its normal length, will ordinarily place the parts in perfect co-aptation; it will be found, on the contrary, that in dislocation the dislodged bone is not so readily reduced, while its replacement is generally accompanied by a distinct snapping noise, as the articular surfaces assume their normal position, which is never observed in cases of fracture. In dislocation, also, the action of the structures surrounding the joint is sufficient to hold the bones in their normal position, while in fracture there is an immediate return of all the previous symptoms so soon as the extension and counter-extension are discontinued.

Prognosis.—In cases of ordinary dislocation, especially if attended to early, a favorable prognosis can usually be given; whereas, on the other hand, if the case be badly treated, neglected, or complicated with fracture, or serious injury of the adjacent textures, violent arthritis may ensue, accompanied by constitutional and local disturbance, sufficient to endanger not only the limb, but even the life of the patient. Luxations of the orbicular joints, though commonly more difficult of reduction than the ginglymoid, retain their capability of replacement much longer than the latter, and are less frequently attended by unfavorable results. A dislocation of the shoulder, for example, may continue for several months, and still be restored to its original position, and the function of the articulation regained, while the elbow, or other ginglymoid joints will become irreducible in a few weeks, and hence are comparatively useless.

Pathology.—A careful dissection of a recently luxated joint, occasioned by mechanical force, reveals the capsular ligaments more or less torn, with contusion, stretching, and laceration of

muscles, ligaments, nerves and arteries, while the extremity
he bone will be found removed to a greater or less distance
n its socket and resting upon some of the soft structures or
acent bone. The socket will generally be occupied by blood
sed from the lacerated vessels, which may be either in a fluid
e or partially coagulated.

n cases of dislocation resulting from muscular action, the lig-
nts are only slightly torn, and it is probable that in some cases
upture whatever occurs, though more or less contusion and
thening of these structures must necessarily be present in every
ance.

rovided the dislocation remains unreduced, inflammatory action
lts with effusion of plastic matter, gluing the neighboring tis-
together, while the cavity of the socket becomes filled with
rous or bony deposit, which completely obliterates, eventually,
portion of the joint. Not unfrequently the effused lymph con-
ts strong and extensive adhesions to the bone, including
ortant nerves and blood vessels, in which event attempts at
uction may be attended with severe laceration of an artery,
aneurism or death from hemorrhage ensue in consequence.
ortant changes also gradually supervene in the immediate
nity of the head of the bone; the hard or soft textures upon
h it rests in its new position become in a measure absorbed
ontinued pressure, while subsequently an osseous deposit
rs around the head of the bone, forming a new articulating
ty. The margins of the new socket formed by thickened and
lensed fibrous tissue, are more or less firmly attached to the neck
haft of the bone, and the whole surface is lubricated with syno-
fluid. In consequence, however, of the continued inactivity
he limb, the muscles gradually become atrophied, and in
e instances their function is completely destroyed.

reatment.—The *first* indication to be complied with is, the
ediate reduction of the luxated bone; *secondly*, to retain it
osition and at perfect rest, until the injured structures are
ired; *thirdly*, to combat inflammatory action, and lastly, to
ore the functions of the joint.

. *Reduction* consists in restoring the dislocated bone to its
ural relations; and hence the obstacles to be surmounted are,

first, to engage the surgeon's attention in determining the means best adapted to accomplish this result. Of the causes opposing the ready and immediate reduction of dislocations, the resistance offered by the spasmodic action of the muscles connected with the displaced bone, is not always, as formerly supposed, the chief agent in preventing the restoration of the displaced bone to its natural position, though commonly this is undoubtedly the case. The barriers interposed in consequence of osseous prominences, and the frequent entanglement of the head of the bone among the surrounding muscles and tendons, must necessarily, in many cases, offer a serious embarrassment to the efforts of the surgeon; while, in particular instances, the reduction is not only impeded, but wholly prevented by the resistance afforded by the capsular ligament, the rent made through it by the passage of the head of the bone being almost entirely closed, by contraction of the edges of the aperture around the neck, in consequence of which the head is unable to re-enter the capsule.

The means commonly employed for overcoming these and whatever other obstacles that may exist, include *extension* and *counter-extension*, *pressure*, *rotation*, and *circumduction*, aided, if necessary, by the administration of agents to produce relaxation of the system. In order, however, that manipulation or the application of mechanical contrivances may prove effectual, it becomes a matter of the first consequence that the surgeon thoroughly acquaints himself with the exact relation which the displaced bone sustains to the neighboring structures, and to understand what muscles and ligaments antagonize the reduction. This will, of course, demand a ready knowledge of anatomy, physiognomy of the joint, and a perfect familiarity with the functions of the individual structures influencing the various movements of which the articulation is capable.

Extension consists in the application of force to overcome the contraction of the muscles, while *counter-extension* is the opposing force preventing the yielding of the entire limb or body. These means may be exerted by the use of pulleys, napkins, sheets, or by the hands of the surgeon and assistants. In all cases the extending power should be exerted slowly and continuously, as otherwise the spasmodic action of the muscles is

eased, while there is also danger of creating other mischief. eover, the extension should be made in the line of the dislo- d bone, its axis being gradually changed as the bone assumes normal position.

ormerly this method of extension and counter-extension was loyed most *heroically*, aided by bleeding *ad deliquium*, and free administration of antimony, tartar emetic, opium, etc. ong the recent improvements in practical surgery, however, the least worthy of notice, is the application of scientific and lligent *manipulation* in the reduction of luxations, by which *ation* and *circumduction*, aided by gentle *pressure*, will ost invariably accomplish what great force has frequently ed to effect.

he facility of reduction will, in all cases, be materially increased successfully diverting the patient's attention at the moment making an effort to effect the restoration of the bone. This usually be done by conversation, or by some sudden exclam- n, or unexpected news. In the event, however, of the contin- ion of spasmodic action, it may become advisable to employ anæsthetic. By this auxiliary measure every voluntary mus- may be perfectly relaxed, while the patient is, at the same e, exempt from the pain which might otherwise be unavoidable. er and chloroform, mixed in the relative proportions before en, and administered in the manner described on page 138, . 1, will be found the most reliable and effective agent, and uld never be neglected in cases long resisting the efforts of surgeon.

2. In order to fulfill the second indication, it will be necessary prevent all motion of the injured joint, as the additional irrita- n which would otherwise be induced, could not fail to increase inflammation of the contused and lacerated structures, and s impede the healing process. To accomplish this, if the injury situated in the lower extremity, the patient should be placed in easy or reclining position, and the necessary bandages and ints applied to keep the bone in place. If, on the contrary, e of the upper extremities be affected, the limb should be sup- rted by a sling, having appropriate bandages previously applied, d the patient be permitted to walk about.

3. The inflammatory action is to be combatted by the use of *water dressings*, which should be medicated with *Arnica*, *Ruta grav.* or *Rhus radicans*, and, if the injury be severe, should be applied warm for the first forty-eight hours, the same remedy being administered internally. *Aconite* will be appropriate in every case where there exists marked febrile reaction.

Rhus tox. or *Ruta grav.* should be exhibited, provided there be evidence of injury sustained by the tendons.

4. To restore the functions of the joint, and thus prevent the occurrence of anchylosis, requires that passive motion be instituted so soon as the inflammation is subdued. It should be practiced gently, though perseveringly, at first, once or twice per day, and afterwards more frequently until the motions of the joint can be performed voluntarily. The absorption of the fluids effused into the cellular tissue, may be promoted by the cold douche, friction with the dry hand, electro-galvanism, and attention to the general health, and by the internal use of *Apis*, *Ars.*, *Bry.*, *Rhus*, *Hellebore*, *Iodine* and *Merc.* *Ruta grav.* or *Mezereum* may be preferred where the periosteum is injured, or the ligaments of the joint have suffered in consequence of the injury.

In the future conduct of the case, such remedies will be required as existing circumstances demand, and which will be found in connection with the general principles of surgery, vol. 1, subject, Inflammation and its Treatment.

Compound Dislocation is a dangerous complication in consequence of the synovial inflammation, ulceration of cartilage and violent constitutional disturbance with which it is liable to be followed. The question of amputation will depend on precisely the same contingencies as in compound fracture, viz: old age, shattered constitution, communition of the bone; extensive bruising or laceration of the integuments, so that the wound cannot be closed; laceration of large vessels, etc. To save the limb, the dislocation must be reduced; if the end of the bone protrude through the skin, and reduction is rendered impossible, the aperture should be slightly enlarged, or the end of the bone sawed off, so as to effect reduction; the wound must then be closed and covered with a soft compress saturated with a lotion of *Hypericum*, *Ruta* or *Calend.*, according to the nature of the tissues most

ved in the injury. In all essentials the case should be
d as a wounded or injured joint.

slocation and Fracture.—In a case involving both of
injuries, it is recommended that the fractured bone be first
ecured in bandages and splints, and the dislocation be
ed immediately afterwards. If the dislocation is not attended
til after the fracture has united, it may become exceedingly
lt, and perhaps impossible to reduce it after the lapse of
Again, in the attempt at reduction afterwards, the bone
be broken, and thus seriously jeopardize the success of the

CHAPTER II.

LOCATION OF THE BONES OF THE HEAD AND TRUNK.

SECTION I.

DISLOCATION OF THE JAW.

islocation of the Inferior Maxilla is termed *complete*
both condyles of the jaw are thrown from their socket—*par-*
when only one is displaced. The former is far more frequent
the latter, and may occur in consequence of external violence
ed to the chin, or from the spasmodic action of the depressor
les in yawning, laughing, or vomiting. The accident has also
occasioned by attempts to introduce some foreign body into
nouth, by the strain exerted in the extraction of a tooth, and by
ulsions. It is commonly met with between the twentieth and
ieth years of life, and is found to occur more frequently in
en then in men, the proportion being as two to one.

Anatomical Relations.—The temporo-maxillary articulation is formed by the condyloid process of the inferior maxilla and the glenoid fossa of the temporal bone. It is strengthened and held in position by the capsular, internal and external lateral and stylo-maxillary ligaments, while the joint surface of each condyle moves upon an intra-articular cartilage which divides the articulation into two cavities, each lined by synovial membrane. The articular eminence lies immediately in front of the glenoid cavity and at the root of the zygomatic arch. The muscles employed in drawing the jaw upwards include the temporal, masseter, and internal pterygoid; while it is drawn downwards by the action of the digastricus, mylo-hyoideus, and genio hyoglossus; forwards by a few fibres of the masseter and by the external pterygoid; and laterally by the action of the external and internal pterygoid muscles.

Pathology.—The mouth being widely open, the condyle resting upon the summit of the articular eminence, it will be easy to understand how the action of the external pterygoid and masseter muscles, aided by stretching and laceration of the ligaments, may draw the condyles forward into the zygomatic fossa, with the coronoid process resting against the back of the superior maxilla, or in contact with the malar bone at the point of its junction with the superior maxilla. The chin remains directed towards the chest, the depressor muscles being relaxed, while the temporal, principal portion of the masseter and internal pterygoid, are put upon the stretch, and perhaps lacerated to a greater or less extent.

Symptoms.—In complete dislocation the mouth is held wide open, the patient being unable to close it by any efforts of his own; the chin is depressed and thrust forward, permitting the lower line of teeth to project considerably beyond the upper; deglutition and speech are impaired; the saliva is increased in quantity and dribbles from the mouth involuntarily. A depression will also be found to exist between the auditory canal and the posterior margin of the condyle; the condyle can be felt under the zygomatic fossa, while ordinarily the patient suffers considerable pain, in consequence of the pressure exerted upon the temporal nerves. In general, however, the appearance of the patient is so characteristic as to render the true nature of the difficulty plainly apparent.

partial dislocation, the
will be less widely open
in complete luxation,
the jaw will be twisted
ds the opposite side;
w will be more or less
vable; the teeth some-
advanced, while the
loid process can be
y felt in front of the
lar eminence.

Fig. 259.

ognosis.—Provided the dislocation remain unreduced, the
ion of the jaw, ordinarily, becomes in a great measure gradu-
estored. The lines of the teeth gradually approach each other,
ne movements peculiar to articulation are eventually executed
great degree of facility. Speech, deglutition, and mastication
ius restored, and the saliva becomes diminished in quantity
eases to escape from the mouth.

case reduction of the jaw be accomplished soon after the
ent, the prognosis is rarely unfavorable, the use of the jaw
commonly regained in the course of two or three weeks.

duction.—In effecting the reduction of a complete luxation
jaw, the patient should be seated on a low stool, or on the floor,
g his head supported by an assistant. The surgeon stand-
front, introduces his thumbs, protected by a handkerchief
pkin, into the mouth as far as possible, upon the molars, the
s of each hand being placed under the chin and base of the
Pressure is now exerted with the thumbs in order to depress
ondyles by overcoming the contraction especially of the mas-
and temporal muscles, while the chin is at the same time ele-
, by the fingers. The return of the condyles will usually be
npanied by an audible snap. So soon, however, as the bone
out to slip into position the thumbs should be suddenly drawn
the teeth and placed upon the gums, to prevent their being
ed by the spasmodic closure of the jaws.

stead of using the thumbs as a fulcrum, a couple of pieces
rk, or soft wood, may be placed as far back as possible on
grinders, the chin being then pressed upwards, by which means

the coronoid process becomes lifted from the zygomatic fossa and drawn into its natural socket by the action of the muscles.

Provided, however, these means fail, a very effectual expedient consists in reducing one side at a time, taking care that the side first replaced be not reluxated by the attempts to reduce the other side.

In all cases the operation will be greatly simplified by resorting to anæsthesia, which should not be omitted in any instance presenting the least difficulty.

In the partial, or unilateral dislocation of the bone, the reduction is accomplished in a similar manner to that described for the complete form, with the exception that only one thumb is placed in the mouth instead of both.

After-treatment.—It will be prudent in all cases to support the jaw, for at least one week, by the use of a four-tailed bandage, passed around the chin and secured at the top of the head and behind the neck, as the dislocation is particularly liable to occur from very slight causes.

Fig. 260.

Fig. 260 represents the dislocation held in situ by Barton's bandage for the jaw, which is an excellent retentive bandage for this purpose. The food, for some weeks, should be such as will not require mastication. Passive motion, however, should not be neglected, after the first ten or twelve days, while the tone of the stretched and lacerated ligaments will be promoted by the administration of *Rhus tox.* or *Ruta grav.* internally, and externally applied by friction or by the use of compresses, retained upon the injured part by means of the roller.

Sub-Luxation.—Sub-luxation of the jaw is occasionally met with, and consists in a slipping of the condyles from the intra-articular cartilage. It is mostly met with in women of a weak and delicate habit of body, and in persons of a strumous diathesis. The predisposing causes are relaxation of the ligaments and muscles about the joint, while the accident generally occurs in consequence of yawning, vomiting, or biting hard substances.

It is generally attended by considerable pain, a crackling noise

the articulations, and impairment of the motions of the jaw, ile the chin is slightly inclined to the opposite side. The duction is frequently accomplished spontaneously, though in se this does not occur, drawing the jaw somewhat forwards and wnwards will readily effect the replacement.

Treatment.—*Rhus tox.*, *Ruta grav.* and *Staphysagria*, ven according to the particular indications in each case, will nerally effect a cure if persisted in for a sufficient length of ne. I have found *Staphysagria*, in a case treated recently, to ect most excellent results.

In sub-luxations occurring in strumous constitutions, much ben- t will be derived by the employment of those agents which assist giving tone to and building up the impaired organism—the ost important of which are *Calcarea*, *Iodine*, *Phosphorus* and *ulphur*.

Congenital Dislocation of the condyle of the lower jaw is exceedingly rare condition, which has been brought before the ofession through Dr. Smith. It is known by a singular distor- n of countenance. The osseous and muscular structures are rophied on the dislocated side, the teeth of the upper jaw pro- et beyond those of the lower, the mouth can be closed, speech is rfect, and no dribbling of saliva, as is seen in the cases of acci- ntal dislocations.

Treatment.—The treatment must be directed to strengthening e general system by all those agents which tend to invigorate e constitution and give tone to the depressed functions.

SECTION II.

DISLOCATIONS OF THE BONES OF THE TRUNK.

§ 1.—DISLOCATIONS OF THE VERTEBRÆ.

Luxation in any part of the spinal column is an exceedingly rare cident, and almost invariably fatal in consequence of the pres- re exerted upon the cord, or from inflammation of the cord and membranes resulting from the injury sustained. Some very stinguished surgeons, as Delpech and Abernethy, denied the

possibility of a dislocation in any part of the spine without the simultaneous occurrence of fracture. Gross, however, relates a case coming under his own observation, in which a dislocation of the sixth and seventh cervical vertebræ occurred independent of fracture, as shown by a careful dissection. Other cases are also recorded. Still the instances are undoubtedly rare in which the accident is not complicated with fracture, owing to the limited motion of the vertebræ and the firmness with which they are bound together by strong ligaments.

Symptoms.—There are evident symptoms of the compression of the spinal cord, evinced by paralysis of the lower extremities, and other portions of the body receiving nervous branches from below the seat of injury. When the lesion occurs above the origin of the phrenic nerve, death necessarily ensues from suspension of respiration. An unnatural projection will also be detected at the point of injury, the distortion being attended with severe pain, especially upon motion.

Diagnosis.—The diagnosis is commonly very obscure; still, the absence or presence of crepitus will aid somewhat in determining the true nature of the accident, while the peculiar rigidity observed in dislocation, without the existence of crepitation, will usually suffice to distinguish it from fracture.

Prognosis.—The prognosis, as already stated, is always very unfavorable, the danger to life increasing in proportion as the seat of injury approaches the upper extremity of the spine.

Treatment.—As a general rule, very little is to be done. In some cases, especially if the luxation occur in the cervical region, moderate extension and counter-extension may be employed with favorable effect. All manipulation, however, is liable to produce sudden death, and in those instances where the diagnosis is doubtful, and the character of the symptoms indicate that the patient is in no immediate danger, time, with judicious management in combatting the inflammatory action likely to arise, with such remedies as the conditions demand, will often accomplish more than active interference.

But in those cases in which life is in imminent peril, an opposite course of treatment is to be advised, as decisive and judicious measures are the only recourse at command for the relief of

patient. A number of cases are recorded in which manipula- has resulted in successful reduction.

§ 2.—DISLOCATIONS OF THE RIBS.

Dislocation of the **heads of the ribs** from the vertebræ is an ident of exceedingly rare occurrence, and is, by some surgeons, ounted wholly impossible. A few instances of this kind, how- r, are on record, sustained by authority so good as to merit lence. It will be almost invariably associated with fracture he ribs, or of the ribs and spine, and will quite as often prove l.

Treatment.—The constitutional symptoms produced by the urrence of violence sufficiently great to effect such an accident, first require the surgeon's attention, while direct interference t, from the nature of the case, prove entirely futile. Perfect and the judicious administration of constitutional remedies , therefore, comprehend the treatment to be employed.

Dislocation of the **sternal extremity of the ribs** does not en occur, though it is far more frequent than the former acci- t, and usually creates a well-marked deformity. This is espe- ly the case when the cartilages of both sides are displaced. injury commonly results from external violence, though cases reported in which it was due to muscular action alone.

Treatment.—Great care is required to combat, successfully, inflammation likely to arise in consequence of injury sustained he surrounding soft parts. To this end the general measures ady prescribed for the prevention and arrest of inflammatory on are to be applied. Reduction of the displaced bone can ally be readily accomplished by pressure, after which compres- and the spiral bandage of the chest should be applied for its ntion; or, it may be facilitated by bending the trunk back- d, or by directing the patient to make a full inspiration. maintain the reduction, Sir Astley Cooper directs that a "long e of wetted paste-board should be placed in the direction of e of the ribs and their cartilages, the injured rib being in the er; this dries upon the chest, takes the exact form of the s, prevents motion and affords the same support as a splint n a fractured limb. A flannel roller is to be applied over

this splint." Instead of the paste-board, a splint made of either felt or gutta percha, moulded to the parts so as to be completely adapted to the contour of the chest has effected good results. Medicated lotions of *Ruta grav.*, *Rhus rad.* or *Arnica* may be applied constantly to the injured part, for the purpose of keeping down inflammatory action, and to assist in restoring the part, as far as possible, to its normal condition.

§ 3.—DISLOCATIONS OF THE CLAVICLE.

Hamilton writes*: "Of twenty-three dislocations of the clavicle observed by me, five belonged to the sternal end and eighteen to the acromial. Of those belonging to the sternal end, four were dislocations forwards, and one was a dislocation upwards. Of the acromial dislocations, the whole were dislocations upwards, or upwards and outwards." Luxations of this bone, however, are exceedingly rare, as compared with the fractures likely to occur, the proportion undoubtedly being as ten of the latter to one of the former. This difference results from the exposed position occupied by the bone, to the shortness and remarkable strength of the ligaments attached to it, and to the circumstance that the violence is commonly applied in the line of the axis of the bone which causes it to give way in its continuity rather than to become luxated.

1. The sternal end may be displaced in three directions, *forwards*, *backwards* and *upwards*, and commonly results from falls upon the elbow, or from direct violence applied at the shoulder. In dislocation *forwards*, the head of the clavicle can generally be felt as a distinct prominence in front of the sternum; the motions of the arm will be greatly impaired, and accompanied with acute pain at the seat of injury. The corresponding shoulder will be depressed, and falls a little forwards; the pectoral space becomes shortened; the head inclines to one side; while the sterno-cleido-mastoid muscle presents a sharp and well-marked outline. This variety of luxation will be further evident by the motion communicated to the dislocated end of the bone, by moving the shoulder upwards and downwards. In dislocation, the

* Hamilton on Dislocations and Fractures, *Op. cit.* p. 506.

icle retains its normal length, whereas in fracture it is consid-
ly shortened. It is the most frequent form of dislocation.

athology.—The capsular ligament, together with the anterior
posterior sterno-clavicular ligaments become ruptured, while
rhomboid and intra-articular ligaments are more or less
ched and lacerated. The clavicular-fasciculus of the sterno-
oid muscle is carried along with the end of the bone to which
attached, and the intra-articular cartilage may or may not be
laced. Richmond reports a case in which the end of the bone
thrown below the top of the sternum at least three inches.

eduction.—The reduction of this dislocation is rarely
nded with difficulty, though a perfect retention is very seldom,
er, maintained. The facility, however, with which the move-
ts of the shoulder are regained, notwithstanding the unnatural
ion of the bone, render it a matter of no great moment, far-
than the deformity is concerned, whether the efforts of the
eon prove successful or not in keeping the bone in place.
, indeed, it is a question, whether the extreme quiet and
confinement required for the restoration of the torn ligaments
not ordinarily produce more serious consequences than will
t from leaving the bone in its new position.

he reduction, however, may be effected by placing the knee
the spine and drawing the shoulders backwards, or by using
humerus as a lever, in the following manner: Place one hand,
hed, in the axilla, grasping the elbow with the other, which
be raised, thus causing the head of the humerus to press
nst the clavicle and scapula. The shoulder should now be
ed upwards and forwards, and the forearm placed across
hest, allowing the hand to rest on the clavicle of the unin-
l side. A wedge-shaped pad, with its base directed upwards,
w to be placed in the axilla, and a square compress laid upon
head of the luxated bone, and retained by a roller. The limb
then be firmly secured to the side and front of the chest, and
ned in this position for at least two months.

islocation of the sternal end of the clavicle backwards.
dislocation *backwards*, a cavity can be readily detected
e natural situation occupied by the head of the bone, the
mity of the clavicle can be felt behind the summit of the

sternum, and the head is inclined to the opposite side. There will also be a shortening of the pectoral space, an elevation of the shoulder, and inability to use the arm, while more or less dyspnœa, difficulty of deglutition, and cerebral congestion will exist in consequence of the pressure exerted upon the trachea, œsophagus, and blood vessels, and a partial arrest of circulation in the arm from pressure upon the subclavian artery.

Pathology.—The ligaments are completely ruptured, and the sternal attachments of the cleido-mastoid muscle are in a great measure severed.

Reduction.—The same principle is applicable here that was stated in the treatment of dislocation forwards, the shoulder being carried upwards, outwards and backwards, and the parts retained in this position by laying the patient on his back upon an elevated pillow or cushion, or by employing a figure-of-8 bandage, with a thick compress between the shoulders.

Dislocation upwards is exceedingly rare. The symptoms presented are a depression of the shoulder forwards and downwards, with a marked interval between the clavicle and the cartilage of the first rib. The sterno-mastoid is put upon the stretch, and there is also a diminution of space between the point of the shoulder and the sternum, while the head of the bone can be felt and seen in front of the trachea.

Pathology.—The ligaments immediately investing the joint are ruptured, so that the clavicle rises from its socket about half an inch, and is found riding upon the top of the sternum, its head being placed between the sternal fasciculus of the sterno-mastoid on the one hand and the sterno-hyoid on the other.

Reduction is readily accomplished by carrying the shoulder away from the chest, as before directed, backwards and upwards, pressure being made at the same time upon the head of the bone. The figure-of-8 bandage should be used, keeping the shoulder well lifted up by a sling, a pad being placed in the axilla. The sternal end of the clavicle is to be held downward by compresses and bandage, while the arm is to be kept at perfect rest, the hand resting on the sound side, and either Fox's or Dessault's apparatus applied to the parts.

2. Luxation of the **acromial end** of the clavicle occurs, prin-

ally, in two directions—*upwards* and *downwards;* while a
w cases only are recorded in which the end of the bone was
rown under the coracoid process. They are due to mechanical
rce acting upon the shoulder, or in its immediate vicinity.

In *dislocation upwards* of the acromial end of the clavicle,
ard and distinct tumor is formed by the projection of the bone,
er the acromion process, or upon the anterior spine of the scap-
, which readily disappears, however, upon elevating the shoul-
r and pressing it outwards. The arm hangs loosely by the side;
e shoulder is slightly flattened, the clavicular portion of the tra-
zius is put upon the stretch, the head inclined towards the injured
le; and it is commonly with great difficulty and pain that the
nd can be elevated to the face. A digital examination, con-
cted by passing the finger along the spine of the scapula to
e extremity of the acromion, will alone be quite sufficient to
termine the existence of this accident.

Pathology.—There is complete rupture of the acromio-clav-
ular ligaments, with more or less laceration of the ligaments
tending from the clavicle to the coracoid process. The action
the trapezius muscle is thus enabled to draw the end of the
vicle above the acromion, which it overrides to the extent of
e-half to three-quarters or an inch.

Reduction.—Frequently the reduction of the bone can be
ected by simply pressing upon its extremity with the fingers,
ile the shoulder is carried upwards and backwards. In other
ses it may be necessary to place a thick pad in the axilla, the
se directed upwards, using the arm as a lever in the reduction
d retention. Drawing the shoulders upwards and backwards,
e knee acting as a fulcrum, and being placed on the spine
tween them will also accomplish a replacement. To retain the
rts in their normal relative position, will require the most con-
mmate skill of the surgeon, and notwithstanding the use of the
ost approved appliances, he will oftentimes fail. As good treat-
ent as can be recommended, however, will consist in placing a
mpress upon the upper and outward end of the clavicle, and
en passing a strap or bandage over the compress and under the
bow, having the forearm at nearly a right angle with the hume-
s and well secured to the chest; or the parts may be retained

in position by the use of Fox's, Dessault's, or Mayor's apparatus, ordinarily used for the treatment of fractures of the clavicle. Or, the spica of the shoulder, described in vol. 1, on page 95, may be employed, recollecting first to apply the spiral bandage from the fingers to the axilla, to prevent venous congestion of the arm.

Dislocation downwards is exceedingly uncommon, but a very few cases having been recorded. The situation of the end of the clavicle beneath the acromion, with unusual prominence of the latter, together with the flattening of the shoulder, and the loss of voluntary motion sustained by the arm, will render the nature of the accident clearly apparent. Should any doubt arise upon the subject, it may be easily dispelled by tracing the outlines of the two bones as far forwards as their articulation. The finger, as it approaches this point, will at once detect the extraordinary prominence of the one and the marked depression of the other, and thus reveal the true nature of the accident.

Pathology.—The injury has always been found to be accompanied by rupture of the acromio-clavicular, coraco-acromial and coraco-clavicular ligaments, the extremity of the bone resting between the acromion and the capsule of the shoulder joint.

Reduction.—The reduction is accomplished by drawing the shoulders outwards and backwards, the knee resting against the spine, at the same time grasping, if necessary, the outer extremity of the bone, and lifting it into position. The elbow being carried across the chest, to afford greater relaxation to the muscles and convert the humerus into a lever for acting more efficiently upon the acromion process. In this case reluxation is not likely to occur, and the indications of subsequent treatment are complied with by firmly securing the scapula to the body by a compress and broad band; or the compress may be retained by the posterior figure-of-8, vol. 1, page 94, terminating the roller by a few horizontal sweeps around the chest, or Velpeau's bandage may be employed as for fracture of the clavicle. Recovery of the functions of the limb may take place in six or eight weeks.

Dislocation *beneath the coracoid process* has been met with in only six instances. The more important symptoms include an unusual prominence of the acromion and coracoid process, the superior portion of the scapula is inclined downwards and for-

s, while a marked depression can be easily detected in the ral situation of the outer extremity of the clavicle, which is ted outwards and downwards, the extremity actually being ed in the axilla. The motions of the arm are not disturbed pt upwards and inwards.

eduction.—Godemer, who reported five of the six cases ded of this accident, effected the restoration of the bone, ays, by directing an assistant to draw the arm backwards outwards, while he grasped the clavicle and lifted it from ath the coracoid process. Vidal (de Cassis), *per contra*, nmends that the elbow be brought down to the side and ned there by the left hand, while with the right, placed e axilla, he directs the upper end of the humerus out- s, converting the arm into a lever of the third class. In procedure recommended by Godemer, the great pectoral mus- vill so far antagonize the efforts of the surgeon as almost to lude the possibility of reduction by the method proposed. process of Vidal, to the author, seems to be the most rational consistent with the anatomical difficulties accompanying this cation. The reduction of the bone in its normal position, l evidently be maintained by the use of the posterior figure- bandage.

onsidering the difficulty of keeping these various disloca- in position, by the ordinary appliances, (in a case in- ng a dislocation of the sternal extremity of the clavicle ards in a female of angular proportions who was exceedingly ful of deformity), I took the precaution of drilling the ends of ones and inserting a silver suture from one extremity to the and drawing the ends in apposition, which was then easily ned by the usual apparatus. The result was perfect union ur weeks.

ouble Dislocation is said to have occurred in one instance.

§ 4.—DISPLACEMENT OF THE LATISSIMUS DORSI.

isplacement of the latissimus dorsi muscle beneath the inferior e of the scapula may also be noticed in this connection. The ulty is recognized by the unusual prominence of the lower

end of the scapula, while the strength and motions of the arm are greatly impaired, especially when the latter is elevated.

Reduction is accomplished by drawing the arm backwards in order to relax the muscle, after which manipulation with the fingers will draw the muscle in place. The arm is then to be secured to the side, by a few circular turns of a roller, until the necessary adhesions are contracted to retain the muscle in its normal position.

CHAPTER III.

DISLOCATIONS OF THE UPPER EXTREMITY.

SECTION I.

DISLOCATIONS OF THE SHOULDER.

Owing to the remarkable freedom of action enjoyed by the shoulder joint, its exposed condition, and the peculiarity of its anatomical structure, it is more frequently the seat of dislocation than all the other articulations of the body combined. In considering the anatomy of the joint, it is to be observed that the large spherical head of the humerus plays in a comparatively superficial and exceedingly shallow cavity of the scapula, and is influenced by the action of powerful muscles; it is, hence, brought in forcible contact with the ligamentous capsule surrounding it, and if the violence be sufficiently great, rupture of the capsule ensues, permitting the head of the bone to escape through the aperture thus formed. The mobility of the scapula is an important obstacle to the occurrence of this accident, while the osseous and ligamentous arch formed by the coracoid and acromion processes with their respective ligaments, together with the peculiar arrangement of the neighboring muscles, adds very materially to the protection and strength of this articulation.

Etiology.—Dislocations of the head of the humerus are commonly caused by external violence, applied *directly*, as in falls or

ws upon the shoulder; or *indirectly*, as when the patient falls on the hand or elbow, the arm being carried away from the body. casionally, however, they may occur in consequence of muscu- contraction.

Varieties.—There are three distinct forms of luxation of the ulder, viz: *downwards* or axillary, *forwards* or thoracic, d *backwards* or scapular. Other varieties have been very nutely described by modern surgeons; still, it is believed that above classification practically comprehends all the varieties dislocation to which this joint is subject, as a more elaborate menclature only serves to embarrass rather than enlighten the dent.

1. The *downward dislocation*, as the name implies, consists a displacement of the head of the humerus into the axilla neath the glenoid cavity.

2. In the *forward dislocation*, the head of the humerus is own *forwards*, resting upon the anterior and lateral aspect of thorax, below the clavicle.

3. In the *backward dislocation*, the head of the bone occu- s a position beneath the spine of the scapula, resting upon, or mediately behind, the posterior edge of the glenoid fossa.

§ 1.—DISLOCATION OF HUMERUS DOWNWARDS.
(SUBGLENOID, OR AXILLARY.)

Pathology.—In this variety of luxation, the head of the hu- erus will be found to occupy a sition in the axilla immedi- ely below the glenoid fossa, rest- g upon the inferior border of e scapula, between the subscap- aris muscle and the long head the triceps. The capsular lig- ment is freely lacerated, and the ng head of the biceps torn asun- r or ruptured from its attach- ent; while the supra-spinatus d deltoid muscles are put vio- ntly upon the stretch, suffering the same time more or less

Fig. 261.

spasmodic contraction. The infra-spinatus, subscapularis, and coraco-brachialis are also in a state of tension, while the other muscles, influencing the motions of the joint, are subjected to little change. The axillary vessels and nerves are more or less compressed, the pressure upon the former often producing an œdematous condition of the limb, while numbness or extreme pain results from pressure sustained by the latter.

Symptoms.—The symptoms attending this accident, which is the most frequent of all the luxations of the shouleer, are commonly so well defined as to enable the surgeon readily to determine the true nature of the lesion. Among the more constant and important of the signs accompanying the occurrence of this accident, is an unnatural flattening of the shoulder, while the head of the humerus forms a hard and distinct tumor in the axilla, readily detected by the touch, and in thin subjects is even perceptible to the sight; the acromion presents an inordinate prominence, with a well-marked depression immediately below it, enabling the surgeon, in some instances, to hook his fingers under this process. The limb is also lengthened an inch or an inch and a half, while the line of its axis is directed towards the axilla; the elbow is carried out several inches from the body and slightly backwards, and cannot be made to touch the side. More or less flexion of the forearm generally exists; numbness, or perhaps severe pain of the entire limb, is produced by the pressure exerted upon the axillary nerves; and the functions of the limb are entirely destroyed or at least greatly impaired.

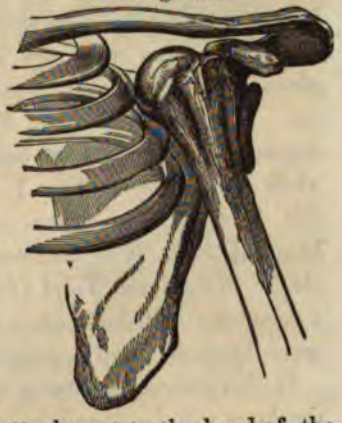
Diagnosis.—Provided the case comes under the observation of the surgeon before any considerable effusion of lymph and blood has occurred, the diagnosis can generally be made without difficulty. The most reliable of the diagnostic signs, however, include flattening of the shoulder, inordinate prominence of the acromion process, the existence of a hard tumor in the axilla, caused by the head of the humerus, and readily detected by rotation of the arm, the lengthened condition of the limb, numbness of the forearm and fingers, together with the position of the elbow projecting outwards. Another, and a most valuable diagnostic sign, has been given by Prof. Dugas, of Augusta, Ga. He writes that, "If the fingers of the injured limb can be placed, by the patient

the surgeon, upon the sound shoulder, while the elbow touches
e thorax, there *can be no dislocation*, and if this cannot be
ne, there *must* be a dislocation."

§ 2.—DISLOCATION OF THE HUMERUS FORWARDS.
(SUBCLAVICULAR, OR THORACIC.)

Pathology.—In this form of dislocation, the head of the hum-
us is thrown to the sternal side of the coracoid process, and
mediately below the clavicle, resting against the serratus magnus
vering the second and third ribs,
mediately below the clavicle and
hind the pectoralis major and
nor muscles. The anterior and
ner portion of the capsule is
tensively lacerated, the long head
the biceps is sometimes broken,
ile the deltoid, infra and supra-
inatus, are put greatly upon the
etch, and occasionally are torn;
some instances, also, the sub-
apularis is displaced upwards and
ckwards, while its tendon is
metimes torn entirely from its attachment to the head of the
merus. Occasionally the axillary nerves are carried forward
th the head of the bone, producing a great amount of pain.

Fig. 262.



Symptoms.—When the head of the bone is displaced anteri-
ly, the elbow is carried off from the side more strongly than in
e dislocation downward, and any effort to bring it in towards
e chest is productive of considerable pain. The elbow also
ojects more or less backward. The deltoid is not put so much
the stretch as in the last variety, nor is the shoulder so much
ttened; but in an emaciated person, the fingers of the surgeon
ay readily be hooked under the acromion process, while the
undness caused by the head of the bone occupies a position
ar the coracoid process of the scapula. The axis of the limb
much changed, being thrown inwards in the direction of the
iddle of the clavicle, the whole body inclining gently to the
me side; there is also more or less inability to move the arm,

especially in a direction forward or outward; a fulness is perceived underneath the clavicle, and to the sternal side of the coracoid process which moves with the shaft of the humerus. To these may be added the common signs of all dislocations of the arm mentioned by Dugas, viz: The impossibility of placing the hand upon the opposite shoulder, while at the same time the elbow is made to touch the front of the chest. If the luxation be of less extent than just described, the head of the humerus will be found resting beneath the coracoid process, having the conjoined tendon of the short head of the biceps and of the coracobrachialis lying upon its anterior surface, while its posterior and outer side rests upon the belly of the scapula in front of the glenoid fossa, carrying with it the belly of the subscapular muscle. Sir Astley Cooper, Fergusson and others speak of this degree of dislocation as being a "dislocation into the axilla;" while Dr. Wood, of New York, who has reported an example of this form of dislocation, with a fracture of the neck of the humerus, calls it a "dislocation under the subscapularis muscle." Malgaigne, Vidal (de Cassis), and others designate it as a subcoracoid dislocation, a term adopted by Hamilton as being more distinctive and appropriate than either of the others.

In this *incomplete* form of dislocation forwards, the head of the bone will be found below the caracoid process and deep in the anterior margin of the axillary fossa, and cannot on this account be so distinctly felt, but the other symptoms are the same as in dislocation forwards under the clavicle.

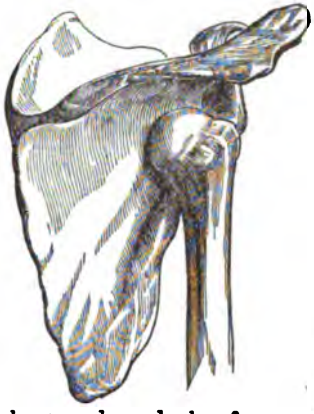
The same rules of treatment that guide the surgeon in relation to dislocations into the axilla will be found applicable to this dislocation, except that the extension will have to be made *at first* in a line backwards from the body to relieve the head of the humerus from its impaction under the coracoid process—after this is accomplished, reduction will be the same as in dislocation into the axilla.

Diagnosis.—The remarkable prominence of the acromion, the tumor formed by the head of the bone beneath the pectoral muscles, together with the shortening of the limb, will usually suffice to distinguish it from the other varieties of luxation.

§ 3—DISLOCATION OF THE HUMERUS BACKWARDS.
(SUBSPINOUS, OR SCAPULAR.)

Pathology.—This dislocation, which is an exceedingly rare currence, is accompanied by extensive rupture of the inferior rt of the capsular ligament; stretching or perhaps laceration the subscapularis and supra-spinatus, the infra-spinatus and es minor being relaxed. The head the bone rests upon the posterior rface of the scapula, between the fra-spinatus and teres minor. g. 263.

Fig. 263.



Symptoms.—The head of the merus can be felt resting upon the fra-spinatus muscle, thus forming tumor in the inferior fossa of the apula; the acromion projects abrmally; while the fullness of the illa being destroyed, the finger may made to pass into the glenoid cav-. The limb is also considerably shortened, and the forearm rried forwards across the chest, and the arm strongly rotated wards. All attempts at motion are extremely painful; the axis the humerus is directed upwards and outwards to a point posteor and external to the glenoid cavity. In addition, the symptm mentioned by Dugas as common to all dislocations of the oulder may be observed, namely, the inability to place the hand on the sound shoulder, the elbow touching the front, or side of e chest.

Treatment.—Concerning the treatment of these various rms of luxation, I beg leave to quote the valuable remarks of r. H. H. Smith. He writes: "As muscular contraction is the ief obstacle to the reduction of these luxations, it is necessary, order to understand the manner in which the force is to be plied to reduce them, that their mechanism and the muscular tachments concerned should be thoroughly understood, and a ief reference to this may now be useful to the student.

When the head of the humerus is luxated *downward into the xilla*, the supra-spinatus muscle is put upon the stretch; it is

also spasmodically contracted, and its spasmodic contraction in the new position of the bone serves to draw the head of the humerus firmly against the inferior edge of the neck of the scapula; hence the spasmodic contraction of this muscle is one of the obstacles that must be overcome in the reduction. Another muscle put upon the stretch, and spasmodically contracted to some extent, is the deltoid, which acts similarly. The other muscles are but slightly changed, the latissimus dorsi and the pectoral being a little relaxed. In the reduction of the luxation downward, means must, therefore, be used to overcome the spasmodically contracted muscles, in order to draw the head of the bone clear of the lower edge of the glenoid cavity; after which, the humerus can readily be carried off from the body, so as to cause its head to ride clear of this edge back into its place. In so marked a manner does the contraction of the supra-spinatus aid in retaining the bone in its unnatural position, that in a *post-mortem* examination of a patient, who died while laboring under an unreduced dislocation of the humerus downward, Sir Astley Cooper, though cutting away the muscles, one after another, found himself unable to reduce the bone until he had divided the tendon of the supra-spinatus muscle.

In the dislocation *forward*, the supra-spinatus is also put upon the stretch, but not so much as the infra-spinatus. The latissimus dorsi is also slightly stretched or entirely unchanged, while the pectoralis major is much relaxed, and would be still more so, were it not for the tumor formed beneath its belly by the head of the bone. The chief obstacles to the reduction are the contractions of the supra- and infra-spinatus with the deltoid, and the force must, therefore, be applied in such a manner as to overcome these muscles, in order to accomplish the reduction.

In the dislocation *backward*, the supra-spinatus, the subscapularis, and the teres major muscles, with the pectoralis major, will be stretched and the deltoid and infra-spinatus relaxed.

Whatever aids, then, in inducing muscular relaxation, must facilitate the replacing of the head of the bone in its true position; and there is no better method of inducing this muscular relaxation than by means of anæsthesia as produced by ether, or ether

Fig. 264.

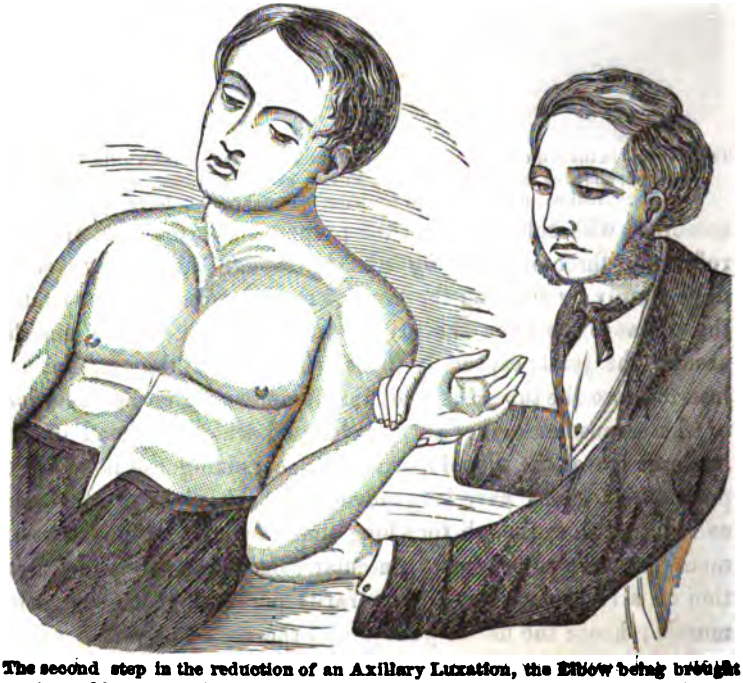
irst step in the reduction of a Luxation of the Humerus into the Axilla, by Smith's method, showing the elevation of the Elbow, and the rotation of the Tuberosities of the Humerus by using the forearm as a lever.

ıbined with chloroform in the proportion of one part of chlo-
ɔrm to three of ether *by weight*, though much may also be
ıe simply by rotating the head of the humerus so as to modify
distance between the origin and insertion of the muscles
und the joint, especially those arising from the scapula, and
erted into the tuberosities of the humerus, the normal relations
these muscles being always changed when the head of the
ıerus leaves the glenoid cavity. Recognizing the influence of
ition, surgeons have long advocated such plans of treatment
required this, though for a long time the sole idea in the treat-
ıt has been to overcome muscular contraction by the applica-
ı of a force capable of temporarily paralyzing the contracted
scle; hence the use of pulleys and the varied powers of exten-
ı and counter-extension in the line of the displaced bone.
ving occasion, in 1858, to treat a luxation of the head of the

right humerus anteriorly, the head of the bone resting beneath the clavicle, and under the pectoral muscle, in a very muscular blacksmith, I suggested the following plan of proceeding, which has since so often succeeded as to promise to supersede the old plan by extension and counter-extension.

Method of the Author by Rotation and Elevation of the Humerus.—In the *anterior* luxation, elevate the elbow as much as possible, and carry it toward the head of the patient, keeping the arm on the line of the body, when the head of the humerus will readily slip into the axilla. In a *posterior* luxation, elevate the elbow, and carry it forward so as to free the head of the humerus from the edge of the scapula, so as to throw it into the axilla, as has long been practiced. An anterior or posterior luxation may also be readily converted into an *axillary*, or *subglenoid*, by elevating the elbow and carrying

Fig. 265.



The second step in the reduction of an Axillary Luxation, the Elbow being brought toward but not against the side, while the Tuberosities are rotated on the edge of the Glenoid Cavity by means of the forearm as a lever.

ackward—the capsular ligament in each luxation being freely
erated by the injury.

The head of the bone being now mainly held against the neck
the scapula by the contracted supra- and infra-spinatus, pro-
d as follows: Elevate the elbow and arm as high as possible,
flex the forearm at right angles with the arm, Fig. 264, thus
axing the supra-spinatus muscle. Then using the forearm as
ever, rotate the head of the humerus upward and forward, so
to relax the infra-spinatus, carrying the rotation as far as
sible or until resisted by the action of the subscapularis mus-
, keeping the forearm for a few seconds in the position with
palm of the hand, looking upward, Fig. 265; then bring
ow promptly but steadily down to the side, carrying the elbow
ards the body and keeping the forearm so that the palm of
hand yet looks to the surgeon, Fig. 266. Then quickly but
tly rotate the head of the humerus upward and outward by
rying the palm of the hand downward and across the patient's

Fig. 266.

body, Fig. 266, and the bone will usually be replaced. Shou difficulty occur from well-marked muscular development, indu anæsthesia.

This method of reduction occupies but a few seconds, and ma be accomplished while the patient is engaged in conversation. consists of three periods: Elevation of the elbow and rotatio of the head of the humerus by means of the flexed forearm Fig. 264; depression of the elbow while retaining rotation o the tuberosity of the humerus, Fig. 265; leverage and elevatio of the head of the bone into the glenoid cavity by carrying th arm over the chest and reversing the rotation, Fig. 266."*

This truly scientific method of procedure, based upon a thoroug knowledge of the anatomical relations sustained by the shoulde joint, together with a complete understanding of the functio and attachments of the capsular muscles, cannot be too highl recommended to the attention of the student in view of the fol lowing features: First, the simplicity of the manipulation rend ers it capable of being accomplished with the greatest facility second, it is remarkably free from the occurrence of pain; third, it enjoys a *marked efficiency*, which, above all, is the great desideratum to be attained.

Extension and counter-extension as a means of effect ing reduction, has been employed from the earliest times and many and very ingenious contrivances have been devised for its applica tion. But notwithstanding experience has shown that brute force perseveringly applied will, almost invariably, effect reduc tion, still the liability to inflict severe injury by lacerating nerves, blood vessels and other soft parts, render it likely to be superseded to a great extent, if not entirely, in dislocations of the hip as well as of the shoulder, by the more mild and scientific method of *Rotation* and *Circumduction*.

1. In *dislocation of the humerus downwards*, reduction by extension and counter-extension may be accomplished as follows: Sir Astley Cooper's method.—The patient being placed in a hor izontal position upon a bed or table, the surgeon seats himself on the injured side, grasps the wrist of the dislocated arm, and

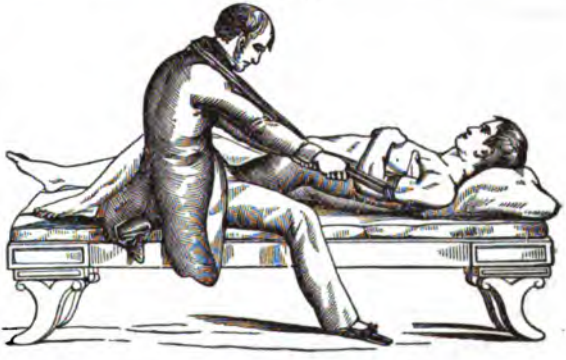
* Smith's Surgery, vol. i, p. 718 *et seq.*

ng a fulcrum of his foot divested of its boot, which is placed
e axilla, he proceeds to draw slowly and steadily until the
of the bone is disengaged from its new position, when the
is brought forwards over the body. The ball of the foot
d be made to act on the humerus, the heel resting against
wer border of the scapula.

ovided, however, reduction is not thus readily effected, a
powerful extension may be made by passing a strong fillet
d the arm, secured by means of the *clove-hitch*.

is fillet or band should be long enough to pass over
surgeon's
ders, and
uld rec-
end that
circle the
above the
, the fore-
eing flex-
nd rest-
cross the
. Figure

Fig. 267.



some instances the knee of
rgeon may prove a success-
bstitute for the heel. In
method, which is also Sir
y Cooper's, the patient is
d in a chair, while the sur-
places his knee in the
, the shoulder being stead-
ith one hand, the other is
oyed in carrying the elbow
oly downwards and in-
s. Fig. 268.

Fig. 268.

e *pulleys* are sometimes
ted to, though the cases
exceedingly rare in which
become necessary, unless

perhaps, in old dislocations. They should in all instance employed with great care, as injury is liable to result to axillary vessels. The counter-extension is best made in their by means of a fold of muslin having an opening in the ce through which to pass the arm, the free ends being fast to a staple in the wall, or held firmly by assistants.

Another method suggested by La Mothe consists in placing patient in a recumbent posture, the surgeon being seated be him; then, seizing the injured arm it is carried perpendicul along the side of the head, at the same time fixing the sca by placing one hand firmly on the acromion. The head of humerus is thus drawn directly into the glenoid fossa. What method however, is employed to effect the reduction of this b or indeed of any other, anæsthesia should be induced, prov the operation is attended by the least difficulty.

2. In *dislocation of the humerus forwards*, the reduc is accomplished in very much the same manner as in disloca downwards, the extension being made in the line of the displ ment. The patient should be placed on his back, when surgeon previously introducing his heel into the axilla makes traction by grasping the affected arm. As the head of humerus approaches the glenoid fossa, efforts should be mad force it upwards and outwards by slight movements of the f the line of extension being at the same time changed, in orde bring the limb obliquely across the chest. The operation wil very much facilitated by having the acromion process stead either by pressing against it with the other foot or by the hand the assistants. The efficacy of making counter-extension at point in humeral dislocations, will be readily appreciated by c sidering the anatomical relations of the scapula. Thus i seen that the muscular structures binding the scapula to the tr exert far less force than the muscles binding the scapula to arm; and as the mobility of the former is the chief obstacl the reduction, it is important that the resisting force be app at a point which will insure the greatest firmness.

3. The *dislocation of the humerus backwards* is rea reduced by the ordinary method of extension and counter-ex sion, at the same time manipulating the head of the bone

ingers from behind forwards. So soon as the head can be cted in the axilla, the limb is to be brought slowly downwards backwards on a line with the trunk.

fter-treatment.—The importance of the after-treatment of ocations of the shoulder, is by no means to be overlooked. rder to guard successfully against the recurrence of the acci-, which is so liable to happen in consequence of the injury sus-ed by the soft parts, it will be necessary to support the elbow forearm and hand in a sling; or if the patient be restless, the should be secured to the side by passing a roller several times nd it and the body, previously introducing a small pad into axilla. Free motion of the limb should not be allowed until lacerated structures are in a great degree repaired, which ordinarily require five or six weeks. The inflammatory action be treated upon the general principles already given, while ive motion is to be judiciously employed to prevent anchylosis. uld partial or complete paralysis of the arm or deltoid muscle ur in consequence of pressure exerted by the head of the erus upon the axillary nerves, it may be necessary to resort nternal and external means for relief. Among the remedies pted to meet this condition are, *Acon.*, *Arn.*, *Bell.*, *Canth.*, *ust.*, *Cocc.*, *Colch.*, *Hyper*, *Nux vom.*, *Rhus*, *Ruta*, *Staph.* ions of *Arn.*, *Ruta*, *Rhus*, *Staph.*, or either of the selected edies may be advantageously used, keeping the parts continu-wet until the inflammation has subsided, while an occa-nal resort to the cold douche followed by friction with the d, or the employment of electro-galvanism will be productive good results.

Œdema of the limb is very likely to supervene upon disloca-n, owing to the pressure of the bone upon the axillary vessels lymphatics, but usually disappears spontaneously in a few days er reduction has been effected. Should it continue, however, any length of time, *Arn.*, *Acon.*, *Ars.*, *Apis*, *Bry.*, *Lyc.*, *otal.*, *Mezer.*, *Rhus*, *Staph.*, *Sil.*, may be administered accord-to indications.

An expedient of great value in connection with internal treat-nt is the application of the spiral bandage from the fingers to axilla.

Emphysema occasionally occurs in certain cases and is distinguished from extravasation of blood consequent upon rupture of the brachial artery, by its elasticity; the normal hue of the skin; continuation of the pulse at the wrist, and by the peculiar crackling noise emitted upon pressure.

The *cause* of emphysema is assigned to a slight wound of the chest, from fracture of a rib, a spicula of bone penetrating the pleura and lungs, from which it rapidly extends to the axilla and occupies the whole of that region.

The following remedies are recommended: *Ars.*, *Bell.*, *Carbo veg.*, *Digital.*, *Ipec*, *Lach.*, *Senega*, *Sulph.*

Arsen.—great dyspnœa, threatening suffocation, with great anxiety and restlessness, face cyanotic with cold perspiration.

Bell.—when the circulation is disturbed, with dizziness, headache and palpitation of the heart, fullness of the head, with congestion to the brain, tightness of the chest, rattling of mucus and expectoration of blood.

Carbo veg., after *Ars.*—great dyspnœa, anxiety and coughing in violent paroxysms; watery, profuse expectoration from the least exertion.

Digital.—complications with heart disease, oppressed breathing in a recumbant position, expectoration of sweet jelly-like mucus with occasional streaks of dark blood.

Ipecac—collection of mucus, difficult to expectorate; expectoration giving only temporary relief.

Lach.—all covering around the chest and neck unbearable, worse after sleeping, torturing cough until a little tough phlegm is thrown off; after *Ars.* and *Carbo veg.* have been used, this follows as an exellent remedy.

Gentle compression will be advantageous in addition to the remedies recommended.

Rupture of the axillary artery leading to copious infiltration of blood, or to formation of aneurism, will be treated first by the reduction of the luxation and afterwards by ligature of the subclavian artery.

§ 4.—COMPLICATED DISLOCATIONS OF THE SHOULDER.

Dislocation of the shoulder joint is occasionally complicated

fracture of the acromion process, neck of the scapula, or the ical neck of the humerus. In the event of such an accident, luxation is the first to receive attention, and after the bone is erly reduced, the fracture is to be treated according to the eral principles given under the head of Fractures. Should serious difficulty, however, arise in effecting the replacement he dislocated bone, the operation will generally be facilitated emporarily employing splints, which will have a tendency to dy the arm and to increase the leverage.

compound dislocation of the head of the humerus is unately a rare accident, as its occurrence is attended by great ger. Reduction should be effected as soon as possible, rging the opening through which the head of the bone pro- es, provided the muscles close spasmodically around its neck uch a manner as to offer an obstacle to replacement. In case, ever, serious injury is done to the surrounding structures, or ne bone, resection should be practiced.

§ 5.—ANOMALOUS DISLOCATIONS OF THE SHOULDER.

ir Astley Cooper originally described a form of partial luxa- of the shoulder, in which the head of the humerus was found est beneath the coracoid process, upon the anterior part of neck of the scapula, below and internal to the glenoid fossa. variety of dislocation, which is exceedingly rare, has been ed, by Malgaigne, Vidal (de Cassis), and others, *subcora-*, and by Velpeau, the *subpectoral dislocation*. It is mpanied by rupture of the anterior portion of the capsular ment, the neighboring muscles and tendons sustaining com- tively little injury, though in the case reported by Cooper, e was rupture of the long tendon of the biceps.

he **symptoms** accompanying this variety of dislocation are so well defined as in the other forms of luxation of the lder. Provided, however, the subject be thin, the head of bone can be felt in its new position by effecting rotation of the . The arm is somewhat shortened; the elbow carried slightly y from the body, and a little backwards, while the axis of the is considerably changed, being thrown in the direction of the dle of the clavicle. Flattening of the deltoid also exists to

some extent, together with an unnatural prominence of the acromion.

The treatment consists in first making extension in the line of the luxation, in order to free the head of the humerus from the neck of the scapula, after which, simple manipulation, or extension and counter-extension, with the heel in the axilla, will readily effect the reduction.

Other forms of luxation of the shoulder have been described by different authors, but are so rarely met with, and their treatment demanding no measures which have not already been given, therefore it is considered unnecessary to enter into a description of them.

Congenital dislocations.—These accidents have been investigated with much care by Dr. R. W. Smith of Dublin, Guerin, Nelaton and others. The lesion may be single, affecting one shoulder only, or double, occurring in both articulations; only *two* varieties have been hitherto recognized; the one, in which the head of the humerus was lodged beneath the coracoid process, termed the *subcoracoid*; the other, where the head of the bone lay upon the surface of the scapula, below the outer and posterior part of the acromion, the *sub-acromial*.

Symptoms.—The symptoms of both of these dislocations are well marked. In the *subcoracoid* variety, the shoulder is flattened, the acromion sharp and prominent, with a well-defined hollow in the supra-spinous fossa, the head of the humerus resting beneath the coracoid process; the arm will be found withered and impeded in its functions, especially abduction; theforearm is more natural and the movements of the hand and fingers nearly if not quite natural.

In the *sub acromial* dislocation, the head of the humerus can be felt on the dorsum of the scapula just below the root of the acromion, where it forms a distinct, unmistakable prominence, the deltoid is flattened externally and in front, the acromion pointed, the arm shortened and withered and is rotated inwards towards the trunk; the forearm and hand are slightly pronated, supination being executed with considerable difficulty.

Treatment.—The treatment of these dislocations must be conducted on the same general principles already given. Mr.

aillard effected the reduction of a congenital luxation of the houlder joint in a girl 16 years of age, the patient recovering th an exellent use of the arm. For several weeks prior to the peration, the parts were daily subjected to passive motion and anipulation so as to induce them to yield the more readily to the xtension and counter-extension employed. The inflamatory mptoms that follow the reduction of these luxations must be ombatted by the means already laid down.

SECTION II.

DISLOCATIONS OF THE ELBOW JOINT.

Dislocations of the elbow are of comparatively frequent occurence and owing to the complex arrangement of the osseous structures entering into the formation of the joint, and the serious complications likely to exist, they are often diagnosed erroneously, and hence unsuccessfully treated.

The varieties of dislocation of the elbow include the following: first, displacement of the bones of the forearm backwards, with or without fracture of the coronoid process; second, displacement of both bones forwards; third and fourth, displacement of both bones laterally; and fifth, the ulna alone may be displaced backwards.

1.—DISLOCATION OF THE BONES OF THE FOREARM BACKWARDS.

Causes.—It is generally produced by force applied to the palm of the hand, the forearm being extended; or it may result from a violent blow received upon the posterior and lower part of the humerus. It may also be occasioned by a severe twisting of the forearm, violence applied at the superior portion of the forearm, and by forced flexion.

Pathology.—Both the bones of the forearm are thrown backwards behind the articulating surface of the humerus, being also drawn somewhat upwards by the action of the triceps, thus forcing the coronoid process of the ulna into the olecranon fossa. The relative position of the radius as compared with the ulna is rarely changed.

Fig. 269.

The brachialis anticus is in a state of extreme tension, or perhaps, lacerated, while the biceps is only moderately tense. The lateral ligaments are more or less severely ruptured, while the posterior and annular ligaments sustain but little injury. The median nerve is also pressed upon in front by the humerus, and the ulna nerve is painfully stretched over the projecting extremity of the ulna from behind.

Symptoms.—The deformity consequent on this variety of dislocation is very marked and characteristic. Thus, the projection of the bones behind the humerus is very conspicuous, while the prominence produced by the condyles of the latter bone will rarely escape detection. The distance from the elbow to the wrist is sensibly diminished, as may be readily shown by taking the measurement from the styloid process of the radius or ulna to the corresponding condyle of the humerus. The forearm presents a somewhat twisted appearance, and is almost constantly in a state of semi-flexion, though in some cases it is very nearly straight. Motion of the joint is greatly impaired, all efforts at extension or flexion being accompanied by severe pain; in most instances, however, the surgeon is able to give the arm a slight lateral motion, which is altogether impossible when the joint is in its normal condition. Unless also there be very considerable swelling, the muscles in front of the articulation, can be felt as tense cords stretched over the condyles of the humerus, while the triceps stands out prominently from behind the bone, forming a marked symptom of the accident. The hand is found in a positive pronation, or strongly inclining to this position.

Diagnosis.—The two circumstances that principally contribute to obscure the diagnosis are *swelling* and *fracture*. The former is likely to supervene rapidly and is generally very considerable. Fracture of the humerus immediately above the condyles is an accident closely simulating dislocation backwards, and the nicest discrimination is often required in order to determine the actual

condition of the parts. The diagnosis, however, can be made by observing that in fracture the bones are readily reduced to their natural relations, but return to their former position so soon as the extension is discontinued; while in dislocation the parts are fixed and greater force is required to effect replacement, but after it is accomplished the parts retain their position. An important sign to be taken into consideration is seen in the fact, that by flexing the forearm in luxation, the prominence produced by the olecranon is increased, while extension tends to diminish it, exactly the reverse of what occurs in fracture; and again, if a circular line be drawn around the joint through the condyles of the humerus it will not cut the point of the olecranon as in a normal condition. In dislocation, also, there is shortening of the forearm, but none in fracture; while the existence of crepitus in the latter accident, and its absence in the former, will generally suffice to render the nature of the injury clearly apparent.

Fracture of the olecranon process can usually be distinguished without difficulty; the elevation of the superior fragment, and the interval existing between it and the remaining portion of the ulna, together with the freedom of motion enjoyed by the joint, will suffice to determine the diagnosis.

Prognosis.—In recent cases the prognosis is favorable; but if the injury be allowed to remain for only two or three weeks without receiving proper attention, the prognosis must be guarded.

Treatment.—Concerning the reduction of the luxation, Dr. Gross writes: "The reduction of this dislocation is extremely easy, if attended to immediately after its occurrence, but very difficult if neglected even for a short time. Upon this subject there is no difference of sentiment among practitioners, writers, and teachers. My experience in regard to it is ample and in perfect accordance with that of the profession generally. I have no recollection of ever being foiled in my efforts in a solitary instance of recent dislocation of the elbow joint, while I can recall to mind a large number of cases where everything that could be done proved unavailing after the third week, and sometimes even by the end of the second. I am not prepared to assign any reason for this; or to say why a displacement, that is always so easily rectified, if properly managed, in its earlier stages, should so

soon become utterly irreducible, resisting and defying all the best directed efforts of the surgeon. We can hardly suppose that it is owing exclusively to inflammatory adhesions, for it is difficult to conceive that they could become either so extensive or so firm, in so short a time, as to produce such a result; whatever, however, the true explanation may be, the fact remains, and this is all that is really necessary for us to know. The practical rule, then, to be deduced from this experience is that all dislocations of the elbow backwards should receive the earliest possible attention, their reducibility being in an inverse ratio to their duration."*

The *reduction* may be effected in several different ways. The most common method is that devised by Sir Astley Cooper, and which is thus described by that great surgeon: "The patient is made to sit upon a chair, and the surgeon, placing his knee on the inner side of the elbow, in the bend of the arm, takes hold of the patient's wrist, and bends the arm. At the same time he presses on the radius and ulna with his knee, so as to separate them from the os humeri, and thus the coronoid process is thrown from the posterior fossa of the humerus; and whilst this pressure is supported by the knee, the arm is to be forcibly but slowly bent, and the reduction is soon effected."

Another method has been recommended by Liston and others, which consists in seating the patient upon a chair, and then drawing the arm and forearm directly backwards, thus relaxing the triceps muscle, counter-extension being made against the scapula.

The reduction may also be accomplished by seating the patient and directing two assistants to make extension and counter-extension, one grasping the wrist and the other interlocking his fingers in front of the humerus immediately above the elbow. The surgeon then places one hand firmly against the olecranon, while the other is employed in pulling backwards in order to produce flexion, thus lifting the coronoid process from the olecranon fossa.

In case of old luxations it may be necessary to resort to pulleys, having the extending band secured to the lower portion of the forearm, while the counter-extension is made at the middle of

* Gross, vol. i, p. 1104.

the arm. The extending force should be continued for some minutes together with steady pressure upon the olecranon. Complete anæsthesia is first to be induced in all cases.

The after-treatment is to be carefully attended to, in order to prevent the occurrence of high inflammatory action and anchylosis. A spiral bandage should be lightly applied from the fingers to the middle of the arm, and in some cases it may be required to employ an angular splint placed on the front of the limb. The forearm is then to be placed in a sling, and the measures already given, adopted to combat inflammation, while the greatest care must be exercised to prevent the supervention of anchylosis. To this end passive motion is to be made so soon as the more violent symptoms of inflammation subside and judiciously continued until recovery is complete. After reduction, in all cases of this kind, it is important to keep the parts constantly wet with *Aconite*, *Arnica*, *Rhus* or *Ruta* lotions to prevent the occurrence of inflammation and to give tone and vigor to the injured structures of the joint.

§ 2.—DISLOCATION OF THE BONES OF THE FOREARM FORWARDS.

This is an accident of exceedingly rare occurrence; so much so, indeed, that some very distinguished surgeons, as Sir Astley Cooper, Vidal (de Cassis) and other writers have doubted its existence, uncomplicated with fracture of the olecranon. Cases, however, reported by Velpeau, Prior, Canton, Monin, and others, prove beyond all question that this form of luxation is occasionally met with as a "pure, uncomplicated affection."

It necessarily occurs as the result of great violence, and is therefore attended by more or less severe contusion of the soft parts, with extensive rupture of the ligaments while the integuments and muscles in front of the elbow are found in a state of extreme tension.

Symptoms.—The forearm is somewhat flexed and may be either shortened or lengthened according to the position the ulna and radius occupy to the condyles of the humerus. Thus, in the case reported by Velpeau, the arm was found in an immoveable, right-angled position, the forearm was considerably shortened,

the head of the radius and the olecranon process being thrown completely forwards, the former occupying the coronoid fossa, while the latter was carried upwards and a little outwards. In Canton's case, however, the olecranon was found to rest directly in front of the humeral extremity, in consequence of which the forearm was correspondingly lengthened. The articulating surface of the humerus can be felt posteriorly, the condyles forming a distinct projection, while a well-marked depression exists in the situation naturally occupied by the olecranon.

Treatment.—Provided the luxation be complete, the forearm flexed and shortened, the reduction should be attempted by forcibly flexing the forearm upon the arm, at the same time making extension from the wrist, employing the knee applied to the lower part of the humerus as a fulcrum. In case the luxation be incomplete, the olecranon resting upon the articulating surface of the humerus, replacement may be effected by extending the forearm, or the same result will be attained by flexing the elbow.

Passive motion is to be commenced early to guard against the occurrence of anchylosis.

§ 3.—LATERAL DISLOCATION OF THE ELBOW.

Lateral dislocation of the bones of the forearm very rarely occurs, and the recorded examples show that in the great majority of cases it is incomplete. It may result in consequence of violence applied at the hand or wrist, the forearm being flexed; but more commonly from a blow received upon the inner side of the forearm or upon the outer side of the humerus. The displacement may occur in two directions, *inwards* and *outwards*.

Dislocation Outwards—Symptoms.—In dislocation *outwards*, or to the radial side, the forearm is slightly flexed and immovable, being also strongly pronated. The deformity is very striking; the internal condyle forms a sharp prominence on the inside of the joint, leaving a depression below; while the ulna resting upon the external condyle can be distinctly felt. The olecranon forms an unnatural projection posteriorly, while there is a very noticeable increase in the breadth of the articulation, with flattening of its anterior surface.

In the *dislocation inwards*, the deformity is, of course, more conspicuous on the ulnar side of the limb, where the olecranon and the head of the radius form a marked prominence, the latter being distinctly felt in the bend of the elbow, the forearm is partially bent and somewhat supinated, and the anterior and posterior muscles of the arm are dragged inwards by the displaced bones.

Treatment.—Moderate extension and counter-extension in the usual manner, facilitated by lateral pressure, will generally effect reduction without difficulty. The same may also be attained by flexing the elbow over the knee in the manner recommended for dislocation backwards. Provided the head of the radius rest in front of the humerus, or of the ulna, the hand should be forced into a state of supination before applying extension.

The after-treatment will require much care in order to keep the parts in their normal position, and to prevent anchylosis.

§ 5.—DISLOCATION OF THE ULNA BACKWARDS.

Dislocation of the ulna alone directly backwards from its articulation with the humerus, is an accident of extremely rare occurrence, so much so, indeed, that it is not easy to conceive that a complete displacement of the upper extremity of the ulna can occur, unattended by fracture of the coronoid process, luxation or fracture of the radius, or a fracture of the external condyle of the humerus. Still it is quite possible that a partial subluxation of the ulna backwards may result from severe falls upon the upper and inner part of the hand, without any of the above complications.

The **symptoms** characterizing it consist of, an unnatural projection backwards of the olecranon, the semi-flexion and pronation of the forearm and hand, the immobility of the joint, and the forearm twisted inwards; the coronoid process is lodged in the sigmoid cavity of the humerus.

Treatment.—The measures applicable in case of dislocation of both bones backwards will suffice to accomplish reduction in the event of this accident.

Compound dislocations of the elbow are serious and are liable to be followed by the worst results, terminating it may be,

in ulceration and caries of the bones of the joint. The severity is materially increased when fracture accompanies luxation. If the patient is young and vigorous, efforts should be made by all means to save the limb. If on the other hand the person is old, infirm, or possessed of a shattered constitution, and attempts to save the limb have failed, it is good practice to amputate rather than jeopardize life by protracted suppuration, ulceration and hectic irritation. In the latter case, amputation to be successful should be done immediately. Excision of the ends of the bones may be employed if the circumstances are favorable.

SECTION III.

DISLOCATIONS OF THE RADIO-ULNAR JOINTS.

§1.—DISLOCATIONS OF THE HEAD OF THE RADIUS.

Dislocation of the superior radio-ulnar joint may occur in three directions, the head of the radius being thrown from its cavity *forwards*, *backwards* and *outwards*. The experience of American surgeons, especially, shows the forward dislocation to be by far the most frequent, while Velpeau, Vidal (de Cassis) Chelius, Boyer and others contend that dislocation backwards is the most common.

1. The *dislocation forwards* may result from a blow received upon the posterior surface of the head of the radius, or from a fall upon the palm of the hand, by which the upper end of the bone is tilted forwards and thrown against the coronoid process of the ulna and the external condyle, at the same time rupturing more or less the annular, anterior and external lateral ligaments. It has, also, resulted from extreme pronation and from violent adduction of the forearm.

Symptoms.—The forearm is slightly flexed, and in a position midway between pronation and supination, though in some cases it is strongly pronated, and cases have also been reported in which there was forced supination. The limb cannot be extended perfectly without causing pain, while attempts to flex the forearm

at a right angle will prove fruitless in consequence of the head of the radius striking against the lower and fore part of the humerus. The head of the radius can be distinctly felt in the bend of the elbow, rotating under the finger, while the condyles of the humerus are unusually prominent. The whole outer aspect of the forearm presents a deformity, being thrown upwards, while a vacuity can be felt in the natural situation of the head of the bone.

Fig. 270.

Treatment.—Extension and counter-extension are to be made, by the surgeon seizing the hand of the patient and making traction in the direction occupied by the limb, the forearm being semi-flexed, to relax the biceps muscle, at the same time the hand is to be carried into forced supination, the head of the radius being pressed downwards and backwards into position by the thumb. The counter-extension is to be applied at the middle of the arm.

After effecting reduction, care should be exercised not to straighten the limb completely for some weeks, as the action of the biceps upon the weakened and lacerated ligaments would be likely to reproduce the luxation. The forearm should, therefore, be placed in a sling at nearly right angles with the arm, and in case the radius does not readily retain its natural situation, a right-angled splint should be employed, placing a small compress upon the head of the bone. Passive motion should be commenced in the course of five or six days to prevent the occurrence of anchylosis.

2. The *dislocation backwards* commonly occurs in consequence of violence applied to the hand when the forearm is strongly pronated and carried beyond the natural line of the body; from a direct blow upon the anterior and upper part of the radius; or from a severe twisting of the arm. This form of luxation, however, is of rare occurrence.

Symptoms.—The forearm is semi-flexed and in a fixed state of pronation; the head of the radius can be felt behind the internal condyle of the humerus beside the olecranon; the motion of the elbow is very limited, both as regards flexion and extension, while supination is impossible. There is a distinct sulcus felt at the upper and outer part of the forearm just below the elbow. The peculiar appearance of the limb is of itself almost indicative of the injury.

Fig. 271.

Treatment.—Extension and counter-extension are to be employed by applying the latter to the lower portion of the arm, while extension is made from the hand or wrist in the line of the displacement; the surgeon at the same time bringing the forearm into forced supination. Pressure should also be applied to the head of the radius in order to push it from behind forwards towards the lesser tubercle of the humerous.

Reduction has also been accomplished by extending the limb forcibly and then suddenly flexing the forearm. When the patient has not been relaxed by an anæsthetic, the return of the bone to its place will be indicated by a distinct snap.

3. *Dislocation outwards* very rarely occurs, and then only in a very incomplete form. Hamilton writes, that we ought not to consider this as a distinct form of primary dislocation, but rather as a consecutive luxation, or at least as only a modification of the forward or backward luxation. Indeed, I think the radius never will be found thrown directly outwards, but always in a direction inclining forwards or backwards.* A well-marked case has never come under my own observation, and from the anatomy of the joint, I am also inclined to regard this variety of dislocation, according to the circumstances of the case, as a modified form of either the forward or backward luxation.

The symptoms will of course, simulate those accompanying

* Hamilton, Op. cit. p. 566.

the two previous dislocations, according as it approaches one or the other, while the—

Treatment will consist in making extension and counter-extension in the usual manner, at the same time facilitating the reduction by pressing the head of the radius downwards and forwards, the forearm being flexed at very nearly a right angle with the humerus.

The closest attention is required in conducting the after-treatment of these dislocations, as they are extremely apt to be reproduced from the slightest causes, while there is also great danger of the occurrence of anchylosis. These accidents are therefore to be guarded against by properly bandaging the limb, aided by compresses and splints or whatever other apparatus may be required to insure perfect rest, as well as medicated lotions to the parts as hitherto recommended. Passive motion must not be neglected in its proper time.

SECTION IV.

DISLOCATIONS OF THE WRIST.

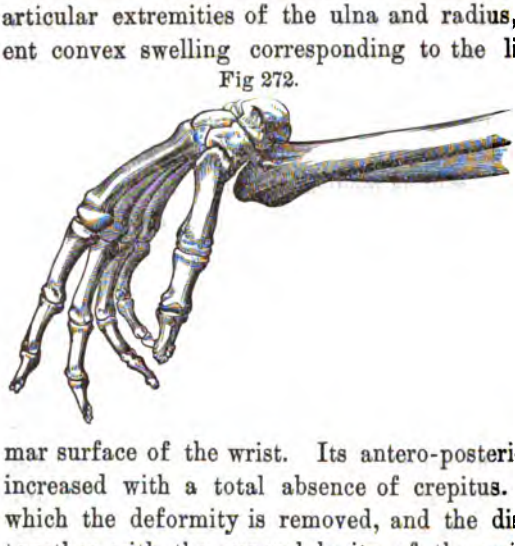
Dislocations of the wrist joint are of so rare occurrence that their existence, as an uncomplicated traumatic lesion, has been denied by even so eminent and experienced a surgeon as Dupuytren and other modern writers. More recent observations, however, have fully established the possibility of this accident; still, there is no doubt that fracture of the inferior extremity of the radius, a lesion frequently met with, has repeatedly been mistaken for a carpal dislocation. The train of symptoms presented by fracture of the lower portion of the radius, especially if it be of an impacted character, so closely simulate those observed in displacements of the wrist, that it often demands the nicest discrimination in order to determine the true nature of the injury. The reason of the extreme infrequency of luxations of the wrist is readily seen by a glance at the anatomical character of this articulation. Thus, the broad, expanded extremity of the radius is joined firmly to the scaphoid, semi-lunar, and cuneiform bones by a number of powerful ligaments, hence giving this articulation greater strength than is enjoyed by the shaft of the bone.

Dislocation of the carpus may occur in two different direction namely, *backwards* and *forwards;* luxation laterally bei necessarily associated with fracture of the styloid process of t radius or ulna, according as the carpal bones are thrown ou wards or inwards.

§ 1.—DISLOCATION OF THE CARPAL BONES BACKWARDS

In dislocation backwards, the carpal bones rest behind t articular extremities of the ulna and radius, creating a promi ent convex swelling corresponding to the line of the first r

Fig 272.



of the bones of t wrist. There slight shortening the forearm; t hand and fingers a forcibly flexed; a the styloid process of the radius a ulna form an unna ural and abrupt pr jection on the pa mar surface of the wrist. Its antero-posterior diameter is mu increased with a total absence of crepitus. The facility wi which the deformity is removed, and the displacement reduce together with the general laxity of the wrist-joint, enable th surgeon to diagnose the injury from impacted fracture of th radius. The existence of the convex swelling points out that is not a mere sprain that has occurred.

To this it may be added, that in luxation there is a larg tumor developed than in fracture, while in the latter accide also, the bones of the forearm are sensibly shortened, admit considerable motion, and can generally be made to elicit a di tinct sense of crepitation. The radius and ulna in luxati retain their normal length and the prominence on the back of th joint is characteristically hard, convex and transversely elongate

§ 2.—DISLOCATION OF THE CARPAL BONES FORWARDS.

In the dislocation forwards the train of symptoms described accompanying the former variety are directly reversed, the bon

of the forearm being thrown behind those of the carpus, while the carpal bones form a well-defined prominence on the palmar aspect of the wrist, Fig. 273. The fingers, are violently extended, the distance between the elbow and wrist is sensibly diminished, while the styloid process of the radius and ulna can be felt behind the hand and riding on the carpus where they form a distinct tumor, the articular groove separating them being occupied by the tightly-stretched extensor tendons.

Fig. 273.

Treatment.—Reduction of luxations of the wrist is readily accomplished by applying extension to the hand, and counter-extension to the forearm at its upper third, at the same time exerting firm and steady pressure by means of the thumb upon the carpal bones. After the replacement has been effected, a spiral bandage, aided by a light splint, should be applied to the forearm, commencing at the ends of the fingers, and the parts subsequently kept wet with diluted tincture of *Ruta*, *Rhus* or *Arnica*—the former of which will prove highly serviceable. Not unfrequently, however, the inflammatory action will be so severe, notwithstanding the most active measures, that serious consequences will inevitably result, as sloughing of the soft tissues, or caries of the carpal bones. The utmost vigilance will be required in order to prevent anchylosis. In the event of suppuration, ulceration, caries, &c., the case will be conducted upon the general principles laid down in the treatment of those respective conditions.

§ 3—DISLOCATIONS OF THE LOWER EXTREMITY OF THE ULNA.

Dislocation of the inferior radio-ulnar joint may be produced in two different directions, the ulna being thrown forwards beyond the line of the radius in one instance, and backwards in the other. These accidents are both of rare occurrence.

1. In *dislocation backwards* of the lower extremity of the ulna, the hand assumes a state of pronation, the fingers are slightly bent, while the styloid process is no longer in a line with the fifth metacarpal bone, the head of the ulna being directed obliquely across the radius in such a manner as to produce a distinct prominence above the level of the cuneiform bone, while the inferior portion of the forearm has the appearance of being unnaturally narrow.

2. *Dislocation forwards* of the lower end of the ulna very rarely occurs, and presents a train of symptoms directly the reverse of those enumerated as accompanying luxation backwards. Thus, the hand and fingers are strongly supinated, while the ulna directed across the anterior aspect of the radius, forms a distinct prominence immediately above and in front of the wrist.

Treatment.—The reduction is accomplished by flexing the forearm to a right angle with the humerus, and firmly extending the hand, at the same time rotating it outwards until it assumes a state of supination in the dislocation backwards, but is to be forcibly pronated in the luxation forwards.

The limb is then to be carefully bandaged, and supported by a padded splint, extending from the fingers to the elbow.

SECTION V.

DISLOCATION OF THE CARPAL BONES.

Dislocation of the carpal bones very rarely occurs, except as a result of gunshot wounds, very few cases being reported in which the accident was occasioned by a blow or fall. The reason of the great infrequency of this injury is apparent from a consideration of the anatomical structure of the parts. Thus, the bones are seen to be bound firmly together on all sides by powerful ligaments, while the degree of motion enjoyed by these bones is exceedingly limited.

Those regarded as most liable to displacement are the *os magnum*, *cuneiform*, and *pisiform*, while the unciform and semilunar have also been known to suffer partial dislocation.

§ 1.—DISLOCATION OF THE OS MAGNUM.

This bone, in consequence of its position and relation to the surrounding structures, is the most frequently luxated of any of the carpal bones, and may be occasioned by forcibly flexing the wrist, as in falls upon the back of the hand. It will thus be made to form a hard, circumscribed tumor, which will be sensibly increased by flexion of the wrist, and correspondingly diminished by extension. The swelling will generally be quite severe, and often materially obscure the diagnosis.

The reduction is effected by extending the hand, and making gentle pressure upon the bone in a direction opposite to that of the displacement. The hand is then to be kept in the extended position by means of two light splints, one placed in front and the other on the back of the hand. It may also be necessary to employ a compress placed on the head of the bone in order to retain it in position. Passive motion should be commenced in the course of ten days or two weeks, though the apparatus for dressing is not to be dispensed with for a considerable time, as the ligamentous structures about the wrist are very slow in uniting.

§ 2.—DISLOCATION OF THE OS PISIFORME.

Dislocations of this bone are due to the action of the flexor carpi ulnaris, which is inserted into it, the ligaments being previously weakened by disease. It is exceedingly difficult to retain it in position after its reduction has been effected; but fortunately its displacement is of comparatively little annoyance. When the accident demands attention, Gross recommends that the hand be placed in a slightly flexed position, in a tin case, extending from the middle of the forearm to the metacarpo-phalangeal joints, the carpal piece being so arranged as to form an obtuse angle with the other. A compress is then to be applied to the lower and inner part of the wrist, in the situation of the displacement, and confined by adhesive strips and a bandage.

§ 3.—DISLOCATION OF THE OS CUNEIFORM

Hardly possesses a well-authenticated case on record, and when it does occur will be amenable to the same general principles of treatment already given, with fomentations of *Arnica* or *Rhus* constantly applied to the part until all inflammatory action has passed away.

SECTION VI.

DISLOCATION OF THE METACARPAL BONES.

Dislocation of the metacarpal bones from the carpus m
occur as a result of extreme violence, but the accident is
that is exceedingly infrequent. The metacarpal bone of
thumb is the most likely to be thus affected, only a very
cases of luxation of either of the other metacarpal bones be
recorded.

Among the cases collected by Malgaigne, the first, obser
by Bourguet, consisted of a forward dislocation of the me
carpal bone of the index finger; the second, seen by Roux,
a backward luxation of the metacarpal bone of the great fing

Two cases are also reported by Hamilton, in both of wh
there was a "partial luxation backward of the proximal ends
the metacarpal bones of the index and great fingers of the ri
hand, produced by striking with the clenched fist."

§ 1.—DISLOCATION OF THE METACARPAL BONES OF T THUMB AND FINGERS.

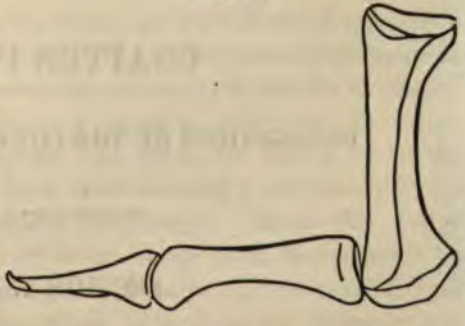
Dislocation of the superior extremity of the metacarpal b
of the thumb may occur in two directions—forwards and ba
wards, the latter being by far the most frequent. It is produ
by violence applied to the back of the thumb, which throws
into a state of extreme flexion; the same result may also
occasioned by a force acting upon the palmar aspect of
thumb.

Symptoms.—The position of the thumb in this injury
variable; thus it is sometimes perfectly straight, or it may
more or less flexed, while in some instances the bone is found
clined inwards towards the palm of the hand. The super
extremity of the bone rests upon the back of the trapezi
forming an unusual prominence, projecting towards the styl
process of the radius to the extent of one-half or three-quart
of an inch.

Reduction is to be accomplished by extension, aided by m
erate pressure. The difficulty in maintaining a secure hold
the dislocated phalanx, while effecting the forcible extens

usually required, is such a common source of embarrassment as to have led to the trial of other means to effect this purpose. Among these means manipulation has been resorted to with the most successful results, according to the plan proposed by Dr. Crosby, of New Hampshire. By this method the displaced bone is more readily reduced than by any other process. It is performed in the following manner, described by the author: "Let the surgeon seat himself so as to face in the same direction as the patient, and place the patient's hand upon his knee. Then turning back the phalanx of the thumb (or finger), so that it will form more than a right angle with its metacarpal bone, let him place both of his index fingers against the ball of the patient's thumb (or finger) while he presses the ends of both his own thumbs against the projecting end of the luxated phalanx, pushing it forcibly forward until the head of the phalanx slips over the end of the metacarpal bone into its place, as may be readily accomplished with but little pain to the patient. The simplicity and elegance of this method by substituting manipulation for mechanical extension supersedes all other processes for luxations of the metacarpal bones, and is entitled to be considered as one of the improvements in surgery.

Fig. 274.



The instrument of Dr. R. J. Levis, of Philadelphia, Pa., exclusive of the above method, is probably the best adapted to the purpose. Its use and the manner of adaptation is best shown by reference to the subjoined cut.

Fig. 275.

Provided, however, the surgeon be disposed to resort to extension and counter-extension ordinarily made, the extending force can be most conveniently applied by means of the clove-hitch,

secured over a wet roller passed two or three times around phalanx to protect the integuments; the counter-extension is made by the use of a handkerchief folded into a cravat, the ter of which is to rest in the palm of the hand, while the ext ities are crossed behind the wrist and brought in front of forearm to be held by an assistant. After continuing the exten for a time, the thumb should be carried inwards, in a semi-circ direction, while, at the same time, firm pressure is to be exerted u the base of the phalanx with a view of urging it over the so what expanded end of the metacarpal bone. But notwithstand the employment of the various methods recommended, still surgeon in some instances may signally fail, in which even subcutaneous division of one or both of the heads of the al flexor of the thumb may be resorted to, after which the reduct is ordinarily accomplished without further difficulty.

CHAPTER IV.

DISLOCATIONS OF THE LOWER EXTREMITY.

SECTION I.

DISLOCATIONS OF THE HIP JOINT.

Dislocations of the hip occur far more frequently than appea possible from a consideration of the anatomical structure a relations of this joint. Thus, the great depth of the acetabulu enables it to receive the large, spherical head of the femur in its socket in the most complete manner, while the latter is secure in this position by a powerful capsular ligament closely and firml fitted around the margin of the articulating cavity. In additio to this, the ligamentum teres, or round ligament, passes directl

from the head of the bone to the bottom of the acetabulum, the articulation also receiving immense strength from the peculiar arrangement of the large and powerful muscles surrounding it, such, for example, as the glutei and psoas magnus muscles, the pyramidalis, obturator externus and internus, and quadratus femoris, together with the muscles on the front and inside of the thigh. All these conduce to the forming of so safe and complete a protection to the osseous structures, that the femur never suffers dislocation, as a strictly traumatic lesion, without the application of great and sudden force, which is effective in proportion as it is diffused over a large surface.

The fact, however, that gradual luxation of the hip may result from a change in the normal condition of the acetabulum and head of the femur, consequent on diseased action, has already been referred to when speaking of coxalgia, or hip disease.

Varieties.—The principal dislocations of the femur are *two anterior* and *two posterior* to a line drawn vertically through the acetabulum; the two posterior are *backwards* and *upwards* upon the dorsal surface of the ilium; *backwards* and *downwards* into the sciatic notch. The two anterior are *forwards* and *upwards* upon the pubes, and *forwards* and *downwards* into the obturator, or thyroid foramen. Of these varieties, which may be designated as iliac, sciatic, thyroid, and pubic, the first is by far the most common, the remaining ones standing pretty nearly in the order of frequency as above enumerated. Thus, Sir Astley Cooper estimated that out of every twenty cases, twelve would be upon the dorsum ilii, five in the sciatic notch, two in the thyroid foramen, and one on the pubes. Hamilton has collected one hundred and four cases of luxations of the hips, including the anomalous dislocations, of which fifty-five were of the iliac variety; twenty-eight, sciatic; thirteen, thyroid, and eight, pubic.

Each of the above dislocations is *complete*, the head of the femur being thrown entirely out of its articulating cavity, and necessarily producing extensive injury to the neighboring soft parts. For example, the capsular ligament, and the ligamentum teres suffer more or less laceration; the rotator muscles, particularly the gluteus, medius and minimus, are severely torn; while the integuments and more superficial muscles will be

likely to sustain great contusion, especially if the force creatin the luxation be direct.

§ 1.—DISLOCATIONS BACKWARDS AND UPWARDS ON TH DORSUM ILII.

Etiology.—This form of dislocation is generally produced b the application of mechanical violence. By this means the thig may be forced into a state of extreme adduction, or of adductio combined with rotation, the femur at the same time receiving a impulse upwards and backwards. Accordingly the accident found to ensue in consequence of falls from a height, the patie striking upon his foot or knee, the displacement being partic larly liable to occur, provided the concussion be received upon t outside of the limb. The injury is liable to result also fro slipping down while carrying a heavy weight upon the head, by severe force applied to the back of the pelvis, the body bei inclined forwards.

Symptoms.—There is marked deformity of the hip, its usu rotundity being lost in consequence of the relaxation of t gluteii muscles, while the trochanter-major is carried into clos proximity with the anterior superior spinous process of the iliu than is natural. The head of the femur may be distinctly fe in its new position, especially when flexing or extending the lim The limb is shortened from one to three inches, the average bei about one inch and a half, and strongly rotated inwards, so mu so that the great toe of the luxated limb points towards the inst of the sound foot, or rests upon it, while the knee, carried som what in advance of its fellow, touches the thigh near the superi margin of the patella. The degree of shortening can be asce tained by extending a piece of tape or graduated measure from t anterior superior spinous process of the ilium to the center the tuberosity of the internal condyle on each side, being caref to have the body placed in a perfectly straight position befo measurement is made.

The thigh is somewhat flexed upon the pelvis, the leg bent up the thigh, thus lifting the heel to a considerable distance above t floor. The flexion of the thigh may be readily increased, to so extent, and slightly adducted, but all attempts at abduction a

practically impossible and attended by severe pain. The degree of motion, however, of which the limb is capable, depends upon the extent of the displacement, the amount of injury sustained by the capsular ligament, as well as to the degree of laceration, stretching, and relaxation of the muscles implicated.

The examination should in all cases, when practicable, be conducted first in the erect posture, after which the diagnosis may be rendered complete by allowing the patient to assume whatever other position the surgeon may designate.

It is here proper to remark that the majority of writers affirm that this form of luxation is attended by a sensible depression of the great trochanter, a statement wholly unwarranted by the cases coming under my own observation, and which I regard as incompatible with the circumstances of the case. Dr. Gross, also, dissents from the above assertion, and I beg permission to quote his remarks upon this point. He writes: "It is surprising that writers should invariably insist upon stating that there is less prominence of the great trochanter in this variety of luxation than natural, whereas a little reflection will serve to convince any one that such an opinion is altogether untenable. To prove the truth of this remark it is only necessary to examine the position which the femur assumes in consequence of the dislocation. The whole limb being strongly rotated inwards, the trochanter, as it lies in its new situation just above the rim of the acetabulum, or partly

Fig. 276

Dislocation upon the dorsum ilii.

above and partly below, is necessarily tilted up and brought forward so as to augment in a very striking degree, its salience beneath the integuments and muscles of the gluteal region. An excellent idea of the changes produced in the projection of the trochanter may be formed by alternately everting and inverting the foot strongly in the ordinary standing attitude, so as to make on the one hand, the big toe of the rotated limb point against the opposite tarsus, and, on the other, against the hollow between the tendo-Achillis and the inner malleolus. In the former position, the bony eminence will be remarkably prominent, jutting out as a rounded mass, whereas in the latter it will hardly be perceptible, or, at all events, comparatively small. In displacement of the head of the bone upwards and backwards, the projection is abnormally distinct, and is, therefore, a sign of great diagnostic value."*

Diagnosis.—There is little or no difficulty ordinarily in determining the true character of the injury, especially, if the surgeon be called immediately after the occurrence of the accident. Fracture of the neck of the femur is the only condition simulating it, and with which it is likely to be confounded. It is only necessary, however, to observe, that in fracture the limb is rotated outwards instead of inwards. That the trochanter is drawn backwards, and is less salient than usual; that the limb can be readily extended to its normal length, but immediately resumes its new position by discontinuing the extending force; and that crepitus can be readily elicited by rotation; also, that in dislocation there is immobility of the limb, while in fracture there is preternatural mobility—the limb in dislocation can be moved only inwards and slightly upwards, but in fracture it can be moved in every direction. Fracture external to the capsule has distinct crepitus. Moreover, fractures of the neck of the femur generally occur in persons of advanced age.

Pathology.—As regards the condition of the muscles implicated in the iliac form of dislocation, it is to be remarked, that the obturator externus and internus, pyriformis, and small rotary muscles (the gemelli, gluteus minimus, and anterior fibres of

* Op. Cit. vol. i, p. 1145 *et seq.*

the gluteus medius) are put greatly upon the stretch—the contraction of the obturator externus being the principal cause of the immobility of the limb. These muscles may also be partially ruptured. The gluteus maximus, a portion of the gluteus medius, the psoas, iliacus, and pectineus, together with the adductor muscles are more or less relaxed, while the capsular ligament is torn at its posterior portion, with rupture of the ligamentum teres.

Treatment.—A diversity of opinion has been expressed by different writers respecting the cause of the great difficulty commonly experienced in effecting reduction of the several varieties of coxo-femoral luxations. Some have been led to regard it as due to the entanglement of the head of the femur in the lacerated capsule of the joint, the edges of the aperture embracing firmly the neck of the bone; others, on the contrary, have ascribed the difficulty solely to the spasmodic contraction of the muscular structures; while others, again, believed the impediment to result from the combined influence of the capsule and muscles. The general impression being entertained, however, that the obstacle consists in the spasmodic action of the muscles affected by the accident, hence the means best adapted to overcome this contractile force was declared to consist in the application of powerful extension, which is advised even to the present time. Reduction by manipulation was, however, from time to time suggested, and dates from the earliest medical records; thus, Hippocrates writes: "In some the thigh is reduced with no preparation, with slight extension directed by the hands, and with slight movement; and in some the reduction is effected by bending the limb at the joint, and making rotation."* Manipulation, aided by slight extension, was also practiced by Richard Wiseman, in 1676; and advised especially in the case of "young and tender children" by Richard Boulton, in 1713; was taught by Daniel Turner, in 1742; and subsequently employed by Thomas Anderson, of Scotland, Pouteau, of Paris, and later still by Physick, of Philadelphia, by Nathan Smith, of New Haven, and by others. Still, the advantages and mechanism of the procedure by simple

* Op. Cit., Syd. ed., vol. ii, p. 642.

manipulation were not brought to the notice of the profession i so clear and impressive a manner as to claim implicit confidenc until 1851, at which time, W. W. Reid, of Rochester, "showed for the first time, by a series of admirably conducted experiment dissections, and clinical observations, that the chief impediment to restoration is not, as was formerly supposed, the contractio of the muscles that are affected by the accident, but the indirec action of the muscles that are put upon the stretch by the mal position of the dislocated bone, and that the operation ma always be safely, certainly, and expeditiously performed, simpl by manual effort, without any assistants, pulleys, or, in short, an extraneous aid whatsoever."

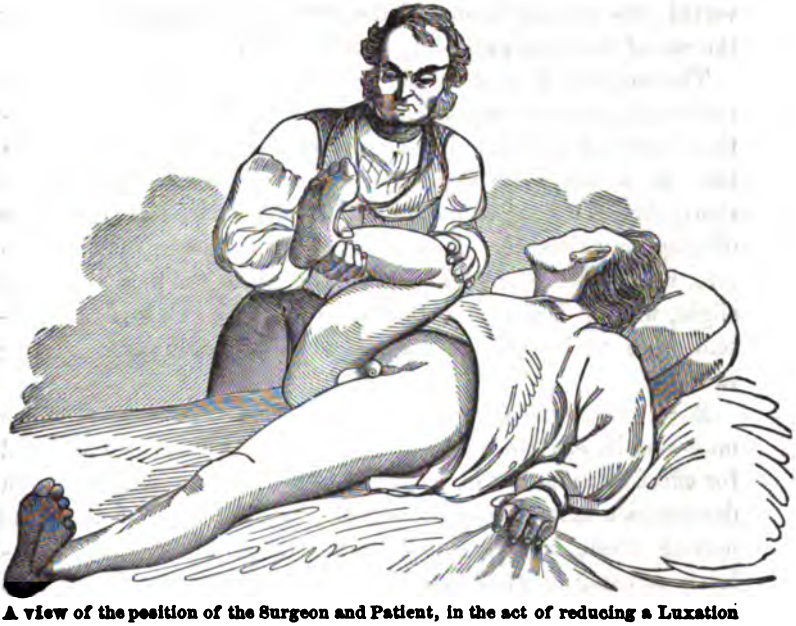
Reid's Method of Reducing an Iliac Dislocation, i thus described by himself: "Place the patient on his back, on low, firm table, or, what is better, upon a quilt folded and laid o the ground. Let the operator stand or kneel on the injured sid and seize the ankle with one hand and the knee with the othe Then flex the leg on the thigh; next strongly *adduct* it, carryin it over the sound one, and at the same time upward over the pel vis by a kind of semi-circular sweep as high as the umbilicus Then *abduct* the knee gently, turn the toes outward, the hee inward, and the foot across the opposite and sound limb, makin *gentle oscillations of the thigh*, when the head of the bone wi slip into its socket with a slight jerk, or an audible snap, an the whole limb will easily slide down into its natural positio beside the other. In a recent case the whole operation can b accomplished in less time than it can be described."*

A careful reference to the above directions shows the operatio to consist essentially of three stages. In the first stage, th thigh is flexed upon the pelvis, the leg bent upon the thigh, an the limb carried in this position across the sound one, and ov the abdomen as high as the umbilicus. Secondly, The knee drawn toward the surgeon, to bring it on a line with the injure side, at the same time turning the toes outward. And, thirdly the foot is carried across the opposite limb, giving a slight later motion to the thigh, when the bone will assume its natural pos

*Buf. Med. Journ., vol. vii., Aug. 1851, p. 129 *et seq.*

tion. This process may be simply described by the following: "Lift up, bend out, roll in."

Fig. 277.



A view of the position of the Surgeon and Patient, in the act of reducing a Luxation of the Femur upon the Dorsum of the Ilium.

The thigh being flexed on the pelvis, and the leg bent on the thigh, the surgeon is in the act of drawing the knee toward him with one hand, while with the other at the ankle he rotates the head of the femur into the acetabulum by the gentle oscillatory movement described in the text. (After Smith.)*

* The advantages claimed by Reid for this method are thus given: "1st. It is simple. 2d. The movements are natural. 3d. There is little or no pain. 4th. There is neither tonic nor involuntary spasms to contend with. 5th. It is better adapted to and more certain of success in cases of long standing than extension by pulleys. 6th. It is free from danger under all circumstances, *provided* the directions are accurately observed. A rocking motion of *the leg* while the thigh is brought to the *straight position* and strongly abducted, is objected to by him as a source of failure, if not of danger in the manipulation. When the thigh is flexed on the trunk, say at an angle of 45° and is gently *abducted*, the head of the bone thus brought close to the lower edge of the acetabulum, if, while gentle oscillations of the thigh are made at the knee, the

The facility with which a luxation on the dorsum of the ili can be converted into one in the sciatic notch, and in fact t readiness in which any one form of dislocation may be co verted into another is one of the greatest recommendations f the use of this manipulation. See Fig. 277.

The surgeon is admonished to use no considerable force conducting these several movements of the limb, but to disco tinue carrying the limb in any one of the directions named, soon as a noticeable degree of resistance is encountered. short, the knee must be moved only in those particular directio offering no resistance. It is to be further remarked that, in ge eral, no anæsthetic should be administered, as the pain is usua slight, while it is desirable that the patient be in a state of co sciousness to inform the surgeon when too much force is bei exerted.

But, notwithstanding the above method is undoubtedly t most simple, efficient and scientific of all the methods employ for effecting reduction of the femur, still cases are recorded whi demonstrate that it may occasionally fail, the head of the bo moving about from one position to another on the pelvis, abs lutely refusing to glide over the margin of the acetabulum in its natural cavity. Considering, also, the great power which m be brought to bear upon the head and neck of the femur by usi its shaft as a lever, it is plain that severe contusion and lacer tion of the soft parts are liable to result; and hence the impo

---

head of the femur does not immediately enter the socket, the kn should be *alternately elevated* and *depressed*, thus varying the angle of t thigh. If, by this manœuvre, alternated with the before-mention oscillating or lateral movement, the head does not enter, we should th cease all motion and hold the thigh and leg perfectly quiet for a sh period, keeping the former still slightly abducted, so that all the muscl &c., may become quiescent. The foot and leg must be kept still als and firmly directed toward the opposite thigh; for if we relax or car it outward, we shall roll the head of the femur away from its resti place and proximity to the acetabulum, and permit or provoke the mu cles to draw it into the foramen ovale, ischiatic notch, or dorsum il After a short time we may repeat our attempts, and in all suitable cas of from four to six weeks' standing, confidently anticipate a speedy a favorable issue."

tance of strictly observing the directions, and studying attentively each individual case, cannot be too strongly urged.

Reduction by Extension and Counter-Extension, as before intimated, may sometimes demand the surgeon's attention, especially in cases of a chronic character, and also in persons of a strong muscular development, and may be applied in the following manner: The patient is to be placed on his back upon a firm table, lounge or bed, and between two staples ten or twelve feet apart, the one in front being higher than the bed, and the other correspondingly lower. A perineal band, about four yards in length, made of muslin smoothly folded, is next placed in the perineum, the tied ends being carried behind the patient's head in the direction of the axis of the limb and fastened to one of the staples. A second band should be passed around the upper portion of the pelvis, and held by an assistant, to guard against drawing the body from its position by the action of the pulleys. A wetted napkin or roller is then to be firmly applied around the thigh immediately above the knee, over which a leathern band is to be buckled, having attached two short straps with rings at right angles with the circular part and directly opposite each other. Instead of the straps and leathern belt we may substitute two pieces of new muslin, each four inches wide and about two feet long, by laying them one upon the inner and the other upon the outer aspect of the lower part of the thigh, so that the middle of each may be confined by passing a wetted roller tightly around them; the upper extremities are then to be reflected downward and tied with the corresponding ends below; the loops thus formed are to be fastened to the hook communicating with the staple in front of the patient. Everything being in readi-

Fig. 278.

ness, the anæsthetic is to be administered, and so soon as the patient evinces symptoms of falling under its influence, the extension should commence, exerting the force very *gradually* and *steadily*, recollecting to have the thigh somewhat flexed upon the pelvis and the knee inclined across its fellow. Fig. 278.

After considerable tension has been produced by traction upon the cord, the efforts of the assistants are to be discontinued for a few moments in order to fatigue the muscles more easily, at the same time exercising care not to diminish the degree of extension already produced. In this manner the succeeding efforts are to be intermitted, the surgeon in the meantime watching closely the position of the trochanter major and the head of the femur by placing his hand upon these prominences. Provided the head of the bone does not readily resume its natural position upon reaching the margin of the acetabulum, the surgeon should seize the thigh and gently rotate the limb in a direction contrary to that of the displacement; or, by means of a noose passed under the thigh and thrown over the surgeon's neck, lift the trochanter major upwards, which will enable the head of the bone to glide into its socket. This latter manœuvre is to be conducted with great care, as well as the rotation; for it is at this stage of the operation that fracture of the neck of the femur is liable to occur. It is also imperative to bear in mind the fact that the success of the pulleys depends more upon the slow and steady application of force than upon the relative amount of power exerted.

Another method of applying extension, somewhat similar to the above, was first recommended, according to Professor Gilbert, by Fahnestock, of Philadelphia, Pa., and consists in the use of a small rope doubled upon itself two or three times, so as to make four or eight strands. The opposite ends of the bundle of ropes thus formed are respectively fastened to the staple and the lower part of the thigh, and the extension made by twisting the strands around each other by the use of a stick thrust between them.

The "dislocation tourniquet" devised by Mr. Bloxom, of London, is a very convenient and powerful apparatus, acting however upon the same principles as the contrivances already described. It has no especial advantages, over the pulleys, and the difficulty

and delay in obtaining the apparatus at the time required makes it altogether inadmissible except in those rare instances where the surgeon provides these instruments beforehand.

Jarvis' Adjuster.—The surgical adjuster, invented by Dr. Jarvis, in the hands of its ingenious inventor has been productive of brilliant results and may be applied to dislocations of the shoulder as well as the hip. It is an instrument of great power, while the direction of its force can be varied with greater ease than the pulleys. I have never employed it in recent dislocations of the hip, but have used it successfully in a case of dislocation of the shoulder. The most important objection to its general use is its expense.

The time required to effect reduction by any of the above means will necessarily vary from a few minutes to several hours, according to the peculiar circumstances of the case.

The after-treatment will consist in resting the knees over a pillow, rotating the affected limb slightly outwards, and keeping the thighs together by encircling them with a broad towel or by a few turns of a roller. The patient should then be required to maintain the recumbent position for three or four weeks, during the first week or ten days of which time the parts are to be kept covered with cloths saturated with *Rhus* or *Ruta* lotions. If the soft parts suffer much contusion and become sore in consequence, *Arnica* lotion may be substituted. Passive motion may be employed as soon as the ligaments of the joint have been sufficiently restored to admit of movement of the limb.

§ 2.—DISLOCATIONS BACKWARD AND DOWNWARD INTO THE GREAT SCIATIC NOTCH.

Etiology.—This luxation generally occurs in consequence of force applied at the knee or foot while the thigh is flexed to a greater or less degree upon the pelvis. It may also result from the falling of a weight upon the back and pelvis, the patient being in a stooping attitude.

Symptoms.—This form of dislocation so closely resembles the iliac variety that some authorities have regarded it as merely a modification of the latter. I am, however, disposed to consider it as a distinct variety, notwithstanding a comparison of

the symptoms exhibited by this and dislocation upon the dorsum of the ilium, differ only in degree; those of the sciatic variety being less marked. The limb is shortened from half an inch to an inch; the foot is turned inwards, the great toe of the injured limb resting on the ball of the great toe of the sound one; while the thigh is somewhat flexed upon the pelvis, adducted and rotated inwards; the head of the femur is also firmly fixed in its new situation, in consequence of which the motion of the limb is almost completely destroyed. The knee is slightly flexed and inclines a little inwards towards the the opposite one; the trochanter-major is unusually prominent, and farther removed from the crest of the ilium than natural.

Fig. 279.

Dislocation backwards and downwards into the great ischiatic notch.

"The characteristic signs of the dislocation are the situation of the head of the bone behind and below the acetabulum a short distance above the tuberosity of the ischium; the comparatively slight shortening of the limb; the firm impaction of the thigh in its new locality; and the unusual distance between the trochanter and the spine of the ilium."

Fig. 280.

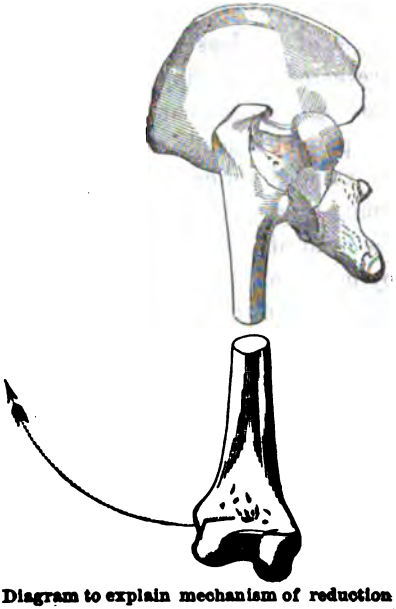


Diagram to explain mechanism of reduction of the hip.

An important diagnostic sign pointed out by Mr. Syme, and which he remarks is never met with in any other injury of the hip joint, whether dislocation, fracture, or bruise, consists in "an arched form of the lumbar part of the spine which cannot be straightened so long as the thigh is straight, or on a line with the patient's trunk. When the limb is raised or bent upwards upon the pelvis, the back rests flat upon the bed; but so soon as the limb is allowed to descend, the back becomes arched as before." This condition is attributable to the action of the psoas magnus and iliacus internus muscles.

Pathology.—The muscles principally affected are the gluteus maximus, which has been found torn nearly asunder, the head of the femur being imbedded in its substance; the gluteus minimus, pyriformis, gemellus lacerated; while the psoas, iliacus and obturator muscles are put severely upon the stretch. The head of the bone rests upon the gemelli muscles, between the sacro-sciatic ligaments and the upper margin of the notch. The capsular ligament is extensively torn close to the edge of the acetabulum and the round ligament completely separated from the femur.

Treatment.—The plan of reduction by manipulation, as recommended in dislocation upon the dorsum of the ilium, is also applicable in this variety. It should, however, be observed that great danger exists in throwing the head of the femur into the obturator foramen, by employing manipulation, and hence the extent of the circuit to be described by the knee is to be somewhat diminished.

If the method by extension be resorted to, it should be recol-

lected that the head of the bone is to be carried forwards m
than downwards; and hence the extension should be made at
angle of at least 45°. The counter-extending band is to
prevented from slipping off from the pelvis on to the thigh,
passing a second band around it at right angles. To effect t
the patient is made to lie on his sound side and the affected li
is extended obliquely so as to bring it across the middle of
sound thigh—after extension has been maintained for some tim
the head of the bone is lifted over the margin of the acetabul
by means of a towel placed under the upper part of the thig
extension in that direction being made by passing the loop of
towel over an assistant's neck, while counter-extension is exert
by his hands resting firmly on the patient's pelvis, the main e
tending force in the direction of the axis of the limb being c
ried on consentaneously.

After-treatment.—In this, as in other luxations, attenti
should be given to bandaging the limbs together by means of
broad napkin or roller, as previously recommended; to comb
inflammation by the means already given under that head; to app
cooling lotions of *Rhus* or *Ruta* to the parts, and to empl
whatever remedies may be indicated by the exigencies of t
case.

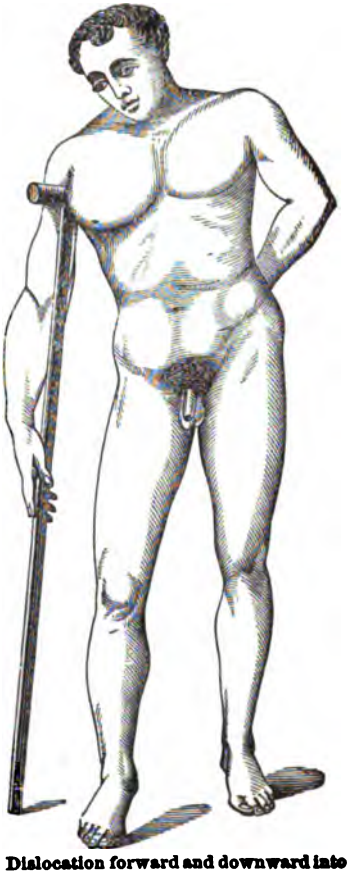
§ 3.—DISLOCATIONS FORWARD AND DOWNWARD INT THE THYROID FORAMEN.

Etiology.—The thyroid dislocation commonly results fro
violence applied at the foot or knee, the limb being in a state
abduction and inclined backwards. It may also be occasioned
the falling of a heavy body upon the hip or upon the back
the pelvis, while the thighs are widely separated and the bo
bent forwards.

Symptoms.—The symptoms are characteristic. The limb
lengthened from one to two inches, and stands outward from t
sound one in a constrained manner, in consequence of the actio
of the gluteal muscles, while the trunk is inclined forwards a
to the affected side by the contraction of the psoas and iliacu
Fig. 281. The limb is also in advance of its fellow, the to
generally pointing directly forwards, neither inverted n

everted, though it is found much easier to turn the foot outwards than inwards. The heel is somewhat elevated, the weight of the limb being supported by the ball of the foot, while the movements, especially of adduction, extension and rotation, are impossible.

Fig. 281.



Dislocation forward and downward into thyroid foramen.

The deformity of the hip is considerable, its convexity being lost by the unnatural position of the trochanter-major which is much less prominent than upon the sound side; while the head of the bone can sometimes be distinctly felt in its new situation.

The diagnosis is readily made, observing the lengthening of the limb, which does not exist in fracture of the neck of the femur, nor in any of the other forms of luxation of this joint; also, by the increased distance of the trochanter-major from the anterior superior spinous process of the ilium; by the bending of the body upon the thigh; the flattened state of the nates; the wide separation of the knees; and by the want of mobility, particularly in attempts to effect adduction, extension, and rotation.

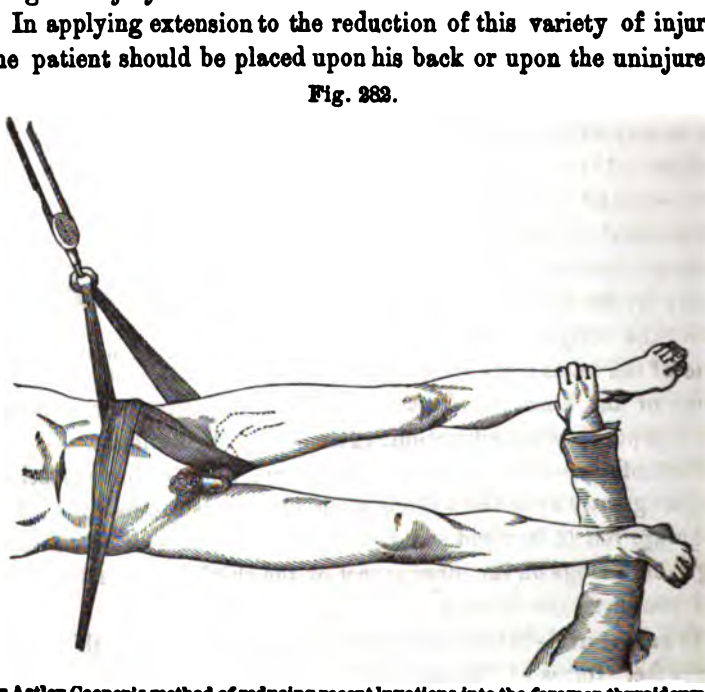
Pathology.—The glutei, small rotary, and pyriform muscles are put greatly upon the stretch, while the extensor muscles of the thigh are felt to be rigid and firm, the iliac and psoas also forming a hard ridge on the inner aspect of the thigh. The adductors and pectineus are relaxed.

Treatment.—Manipulation is found as efficient, in this as in the other forms of femoral dislocation, and though the same general rule answers in each case, it will be observed that slight modifications will be required in particular cases.

Thus, it will be seen by a careful reference to the relatio sustained by the bones in the thyroid luxation, that the thig should be flexed upon the abdomen, with the leg in a state o abduction, after which the knee is to be carried inwards, an finally brought down in a position of adduction. It may how ever be repeated, that the indications will in general be the mos perfectly fulfilled by carrying the limb in those directions offerin the least resistance. It is also to be recollected that in th attempts to accomplish reduction, especially by manipulation the head of the bone is liable to glide into some other form o dislocation, perhaps even more formidable than the original one hence, the fact that the bone assumes a new position in conse quence of the efforts to replace it, is not to be mistaken for restoration of the head of the bone to its natural cavity. Th evidences of replacement, however, are generally quite apparent there being a complete disappearance of the symptoms characte izing the injury.

In applying extension to the reduction of this variety of injur the patient should be placed upon his back or upon the uninjure

Fig. 282.



Sir Astley Cooper's method of reducing recent luxations into the foramen thyroideum

side with his thighs widely separated. An extending band is then to be passed through the perineum, attached to the pulleys, which are so arranged as to exert their force upwards and outwards. Fig. 282. The counter-extending band is made to pass around the pelvis through the perineal band, and secured to a staple or confided to the hands of assistants. So soon as the head of the femur is felt to move from its new position, the surgeon is to grasp the ankle of the affected limb and adduct it forcibly, at the same time carrying it somewhat behind the sound limb.

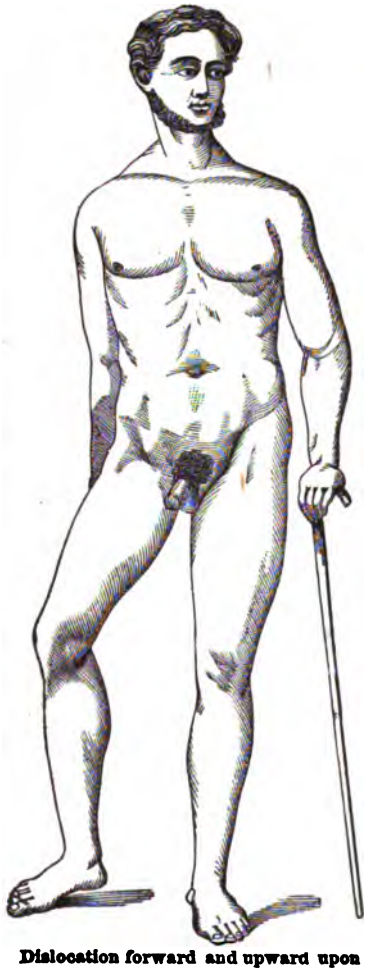
In the *after-treatment* the thighs are to be bound together as directed in the iliac dislocation, but instead of rotating the limb outwards as advised in the latter case, it is to be turned inwards and kept in this position until the soft parts are in a measure restored, after which passive motion is to be resorted to, as in all other forms of dislocation, to prevent the occurrence of anchylosis. *Rhus* or *Ruta* lotions are to be kept constantly to the parts and inflammation subdued by appropriate remedies.

§ 4.—DISLOCATIONS FORWARD AND UPWARD UPON THE PUBES.

Etiology.—The pubic variety of dislocation may be produced by a fall upon the foot while the limb is thrown backward and outward, thus giving the head of the femur an impulse upward and forward, causing it to rest upon the pubes as represented in Fig. 283. It may also result in consequence of stepping into a hole and suddenly bending the body backward.

Symptoms.—"The thigh is shortened, strongly abducted, flexed slightly, rarely extended, and rotated outwards." The extent of shortening is commonly about one inch while the eversion and inclination outwards are considerably greater in degree than is observed in the thyroid luxation; the heel when brought to the sound foot rests upon the instep. The prominence occasioned by the trochanter-major is almost entirely lost, in consequence of its approaching the symphysis pubes, while the head of the femur can generally be distinctly felt as a hard, rounded tumor in front of the body of the pubes, above Poupart's ligament, and external to the femoral vessels. The buttock is also slightly flattened, and the femoro-gluteal fold is higher than natural.

Fig. 283.



Dislocation forward and upward upon the pubes.

Adduction and rotation inwards are very difficult to be effected. The injury can be distinguished from fracture of the neck of the femur by recollecting that in the dislocation there is immobility of the limb, the eversion is considerable and not easily overcome; the thigh is abducted; the head of the femur can be felt in its new situation; while there is also absence of crepitus. In fracture, on the contrary, there is mobility, crepitus, slight eversion readily overcome, little or no shortening, and no abduction.

Pathology.—The capsular ligament is extensively torn and the ligamentum teres broken off completely. The head of the femur lies underneath the iliacus internus and psoas muscles, or it may rest upon the anterior margin of the pubes.

Treatment.—In effecting the reduction of the limb by manipulation no particular directions can be given other than that already laid down. The surgeon must not forget the anatomy of the parts, the position and direction to be given the limb during the manipulation. Several methods by *extension* have been successfully performed by different operators. Thus, Dr. Ingalls, of Chelsea, Mass., reports a case in which reduction was readily accomplished by carrying the limb into a state of extreme abduction and rotating the thigh inwards, the replacement being facilitated by pressure upon the head of the femur.

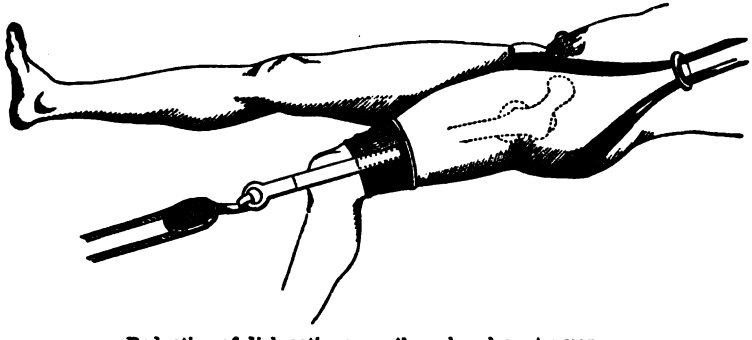
Dr. Fountain, of Davenport, Iowa, was equally successful by strongly adducting the limb, and rotating the thigh inwards, and then flexing it upon the pelvis.

Smith recommends that, "the limb should be strongly abducted, and the foot rotated still more strongly outwards so as to make the trochanter act as a fulcrum, and pry the head of the bone off from the pelvis, when it will slip into the foramen thyroideum. The thigh should then be strongly flexed upon the pelvis, and be carried across its fellow, when by rotating the leg outward, so that the sole of the foot will look outward and upward, the head will be made to describe a semi-circle backward, till, coming over the acetabulum, it will suddenly slip into its place."*

It should be added, that the rotation outward should be discontinued after the head of the femur has risen above the pubes, in order to prevent the head and neck of the bone from becoming entangled in the psoas magnus and iliacus internus muscles, and indeed it may be required to rotate the thigh slightly inwards. Provided, however, the head of the bone has not completely surmounted the summit of the pubes to become in a manner obstructed by the psoas and iliacus, the rotation outwards will not be required at any stage of the operation.

In effecting reduction by extension, the patient should be placed upon a firm table with the injured limb falling to one side

Fig. 284.



Reduction of dislocation upon the pubes, by extension.

and downwards as represented in Fig. 284. The extending band is then secured to the limb immediately above the knee and

* Op. Cit., vol. i, p. 735 *et seq.*

fastened to a staple below the plane of the body and in a
with the axis of the thigh. The counter-extending band
placed in the perineum, and attached to a second staple be
the patient's head and at a height above the table correspon
with the distance below occupied by the first staple. As
head of the bone moves from its new position, its reduction
sometimes be aided by lifting the upper part of the thigh wi
band passed under it and around the neck and shoulder of
surgeon, or by carrying the foot inwards and behind the so
one.

Treatment.—In the management of these several dislocat
of the thigh, the same general principles will guide the surg
in all cases. When the head of the bone has resumed its nor
position in the acetabulum, which will be known by the disapp
ance of the symptoms, and by a comparison of the length of
limb with that of the sound one, a return of the accident is to
prevented by keeping the thighs close together by means o
broad bandage thrown around the pelvis, and properly secured
by a towel pinned above the knees. Rest in the recumbent posi
will be necessary for at least three weeks, and during the f
week or ten days the injured hip should be covered with w
compresses of *Rhus* or *Ruta* lotions. If much injury has b
done to the muscular structures, *Arnica* may be substituted
the previous agents. If the inflammation runs high, *Acon*
should be given internally every hour or two according to circu
stances. When there is little or no inflammatory trouble, *Rhus*
Ruta may be given in lieu of the *Aconite* until all pain is
tirely subdued. After the morbid action has measurably subsi
and a dull aching or stinging pain is complained of, *Bryon*
Jodium or *Ammonia c.*, may be given to promote the remova
plastic matter and prevent the formation of anchylosis. If
parts remain sensitive for a long time, with disposition to becc
worse in bad weather, or during atmospheric changes, a dose
Sulphur at night, with either of the following remedies admi
tered two or three times a day and given according to circu
stances, will be found exceedingly beneficial: *Agnus, Calcar*
Nux vom., *Sepia*, *Silicea* and *Phosphoric acid.*

It is seldom that any of the luxations of the hip recur al

reduction, in consequence of the depth of acetabulum and the perfect adaptation of the head of the femur in its socket.

After two or three weeks, all pain having passed away, motion should be used to prevent anchylosis and to restore the proper functions of the joint, which should be gradually increased from day to day until the patient is able to assist himself, and perform the ordinary process of locomotion.

§ 5.—ANOMALOUS DISLOCATIONS OF THE HIP.

There are various other forms of dislocations of the hip, which, however, are so exceedingly infrequent that a mere mention of them is all that is deemed necessary. The symptoms characterizing them will simulate those accompanying the more common varieties according as they each approach one or the other of the forms already considered.

1. Of dislocations *downward* and *backward* into the lesser sciatic notch, there are several examples. In the case coming under the observation of Mr. Keate, the "limb was strongly abducted, the foot everted, the trochanter-major much depressed, while the head of the femur could be distinctly felt close to, and on a level with the tuberosity of the ischium." The thigh and leg were much flexed and the limb was shortened from three to three and one-half inches. Reduction was accomplished by lifting the superior extremity of the femur outwards by means of a jack-towel, and carrying the knee sharply inwards, when the head of the bone readily returned to its socket with an audible snap.

2. A dislocation *downward* and *backward* upon the ischium, between its tuberosity and its spine, came under the care of Dr. Hewson in the Pennsylvania Hospital. In this case the thigh was flexed upon the pelvis, and rested across the sound one, the toes were turned inwards, the distance between the great trochanter and anterior superior spinous process much increased, while the limb was shortened to the extent of about one inch. The head of the bone could be felt in its new position; rotation could be with difficulty effected, while extension was found impracticable.

Reduction was accomplished by the use of the pulleys. A sim
ilar case is reported by Malgaigne.

3. Dislocation *forward* into the perineum have been occ
sionally met with, and in the example reported by Mr. Park
the head of the femur could be felt behind the scrotum near t
bulb of the urethra; the limb projected at a right angle with t
body, the nates were considerably flattened, and the toes turn
inward.

Reduction was effected by extension downward and outwa
aided by rotation, the pelvis being firmly confined.

In a similar case, treated by the late Dr. Pope, of Saint Lou
the replacement was accomplished by applying extension in t
following manner: "Two loops were applied, interlocking ea
other in the groin, and, using the leg as a lever, extension,
means of the pulleys, was made transversely to the axis of t
body. A steady force was kept up for a short time, and t
thigh bone glided into its socket with a snap that was heard
every attendant and patient in the large ward."

4. Dislocations *upward* in which the head of the fem
occupies a position between the two anterior spinous process
have been known to occur, and are characterized by shortening
the limb at least two inches, extreme eversion of the toes, fla
tening of the nates, slight abduction, and impossibility of effec
ing rotation. Though all the other motions could be performe
though only in a limited degree, and not without great pain.

Though other anomalous forms of dislocation have from tim
to time been met with, the above include those that will l
the most likely to come under the observation of the surgeon.

In their treatment, the general principles, applicable to th
ordinary forms of luxation, must serve as a guide in conductin
the operation. In the great majority of cases, manipulatio
aided by pressure, will readily effect the replacement, as there
always severe laceration of the soft structures. It may be a
visable in some cases, to change the form of the dislocation in
one of the four ordinary varieties, after which, the directio
given for the management of the limb in these cases are to b
followed. Provided, however, other means fail, it will be nece
sary to resort to the pulleys.

§ 6.—CHRONIC DISLOCATIONS OF THE HIP.

A considerable diversity of opinion exists respecting the length of time that may elapse after the occurrence of a luxation of the femur, and the surgeon still be justified, in view of his own reputation and the advantages likely to accrue to the patient, in attempting reduction. The unsatisfactory character of the statistics relating to this subject, together with the variety of circumstances influencing the different cases, render it impossible to give instructions that shall prove applicable in every case. Sir Astley Cooper has, however, been generally received as authority upon this point. He writes: "I am of opinion that three months after the accident, for the shoulder, and eight weeks for the hip, may be fixed as the period at which it would be imprudent to attempt to make the reduction, except in persons of extremely lax fibre, or of advanced age. At the same time, I am fully aware that dislocations have been reduced at a more distant period than that which I have mentioned; but in many instances the reduction has been attended with evil results." This opinion is undoubtedly as correct as any that can be given; still it is to be recollected that the most serious consequences have supervened upon attempts to accomplish replacement at a much less time, while it is also true that restoration of the joint has been successfully effected at six months and even a year after the occurrence of the injury. The attending circumstances in each case should alone guide the surgeon.

§ 7.—CONGENITAL DISLOCATIONS OF THE HIP.

Congenital dislocation of the hip joint is a variety of displacement existing at birth, or occurring soon afterwards, and is commonly met with in children of a strumous diathesis. It also appears from reliable statistics that female children are far more frequently the subjects of this condition than males. Thus, of the forty-five examples collated by Dupuytren and Pravaz, only eight were males.

The dislocation may be single or double, partial or complete. Of the latter, four varieties have been observed, 1. *Upward* and *backward*, upon the dorsum of the ilium; 2. *Upward* and *forward*, the head of the femur resting upon the eminentia-ilio-

pectinea; 3. *Downward* and *forward* into the obturator fo
men; and, 4. *Directly upward*, into the space between the t
anterior spinous processes of the ilium. The iliac variety is, ho
ever, by far the most common.

Etiology.—The *characters* of this malformation are, sho
ening of the affected limb, unnatural projection of the gr
trochanter, ascent of the head of the femur into the iliac fos
inversion of the leg, and obliquity of the pelvis. The motions of
joint, particularly those of abduction and rotation, are constrain
and imperfect; the muscles of the upper part of the thigh are co
tracted, or drawn toward the iliac crest; the limb is thin, was
and out of all proportions to the rest of the body; the tuberos
of the ischium is almost uncovered, and consequently unusua
prominent; the upper part of the trunk is thrown backwar
while the lumbar portion of the spine projects forwards, bei
concave behind; the pubes is placed almost horizontally on t
thighs; and the ball of the foot alone touches the ground wh
the child stands erect.

In the recumbent posture, when the weight of the trunk
taken off, and the muscles are relaxed, most of the symptoms
the luxation disappear, and the limb may be shortened or elon
ated at pleasure. In walking, the body is inclined towards t
sound side, and the head of the dislocated bone sinks towa
the cotyloid cavity by its own weight. As age advances, t
limb becomes shorter, in consequence of the femur ascendi
higher and higher on the ilium; the obliquity of the pelvis au
ments; and the power of locomotion, already so much impaire
is completely destroyed.

Congenital dislocation of the hip joint may, in general,
easily *distinguished* from other accidents or maladies by t
affection being observed at or soon after birth, by the obliqu
of one or both thighs; by the absence of pain, swelling a
ulceration; by the head of the femur being displaced witho
any external violence; and by the ability of the surgeon to length
or shorten the limb at pleasure. In disease of the hip the
is always more or less pain, with a feverish state of the syste
and gradual failure of the strength; the parts about the joi
are tense and swollen; the limb, at first somewhat lengthene

becomes afterwards shortened, and cannot be extended without the greatest suffering; and the motions of the ilio-femoral articulation are permanently impaired.

Pathology.—The *pathological* appearances vary. In general, the cotyloid cavity is partially obliterated, or entirely deficient, being replaced by a small, irregular, osseous prominence, devoid of cartilage and synovial membrane; the head of the femur, often flattened at its antero-internal aspect, rests in a sort of superficial fossa on the dorsal surface of the ilium; the round ligament, as was before remarked, is elongated, partially worn away, or even altogether absent; and the surrounding muscles are either atrophied, transformed into a yellowish, fatty, fibrous tissue, or preternaturally developed. In the latter case, their action is preserved; in the former it is very much restricted, or totally annihilated.

The arteries are serpentine and sinuous and are more or less contracted in their calibre, while the veins are more direct in their course and larger than normal in their diameters. The nerves are smaller than natural and are disposed in a direct course for distribution in the muscular tissues. Extension of the limb to effect its reduction puts the nerves upon the stretch causing pain. The function of the limb is more or less impaired, in consequence of the inadequate supply of blood to the periosteum, medullary membrane and osseous structure, hence the liability to curvature, or fracture, from the inordinate muscular traction to which the limb is sometimes put.

Malformation of the pelvis is an invariable accompaniment of some forms of congenital dislocations, and in the female may give rise to various complications in cases of parturition, including the necessity of premature labor or instrumental delivery.

Prognosis.—The prognosis is generally unfavorable, but in a few cases much benefit has been effected by proper treatment and, judging from the efforts of nature in certain patients to retain the functions of a joint, although the several parts composing it are in a new and abnormal position, "we are encouraged to believe," says Davis, "that, when the imperfect (by reason of arrest of development) head and neck of the femur are placed in what may exist of an acetabulum, and

retained there *unwillingly*, the functions of a joint be kept up and stimulated by passive exercise of the parts—that a we have done this much, the original law of development come to our aid and that the sound parts will be partially if wholly restored, or at least will keep pace with the future gro of the body. We have better reason to anticipate such a re than other changes and efforts at reparation that we observ take place in many cases of injury."

The younger the subject at the time of reduction, the gre the probabilities of a perfect recovery. The mere restoratio parts to their natural position will not be sufficient; they n not only be restored, but passive motion must be assiduously formed, while at the same time it should not tend to displa ment. As much depends upon our bringing into action the law functional growth, as the law of primary development. Th have been instances where all the parts of a joint, even to bo have been formed where none existed previously.

Treatment.—The treatment of congenital dislocation of hip joint is constitutional and mechanical. If the constitution the patient is impaired, and the powers of life deteriorated, m benefit will be derived by a proper course of constitutional treatm with a due consideration of those hygienic and dietetic adv tages that tend to the re-establishment of the depressed organi which are more clearly pointed out under the head of Disord from Perverted Nutrition, vol. 1, page 372. As important au liaries, recourse may be had to the shower bath, either salt or fre followed by dry friction, or rubbing the parts with *Rhus* or *Ru* lotions once or twice a day. In cases of recent standing, perm nent extension by means of proper apparatus may be tried, conjunction with constitutional treatment, with some prospect success. The means recommended and practiced by Guerin, Paris, in which he uses preparatory extension, first, to elongate muscles as much as possible; second, to divide the muscles wh extension has not answered the purpose; third, to make extensi of the ligaments, and in case that does not suffice, their subcu neous section; fourth, manipulation destined to effect reducti fifth, treatment designed to consolidate the reduction, which co sists in the application of proper apparatus to maintain t

extension and separation of the divided tissues and to retain the head of the femur in its place; and, lastly, the gradual execution of movements proper to complete the coaptation of the surfaces and gradually to establish the physiological functions of the joint. Most surgeons have confined their efforts to reducing the dislocation, abandoning all cases as hopeless where there was a complete absence of the natural socket, but Guerin has advanced a step further and has attempted to establish a new socket upon some point of the pelvis as near as possible to its natural articular fossa. The means adopted by Guerin are based upon a recognition of the processes which nature employs for the attainment of the same purpose. "I have shown" says he, "that the essential condition of the formation of artificial cavities is perforation of the articular capsule, and the placing in contact of the luxated extremity with an osseous surface, and that the condition of the maintenance of this abnormal support is the intimate adherence of the borders of the rent with the circumference of the new cavity. To this end I commence by practicing, under the skin and at the point corresponding to that where it is most convenient to fix the luxated extremity, scarifications of the capsule down to the bone to which it is attached. By this means the dislocated extremity is placed in immediate contact with the bony surface upon which it reposes. It makes upon this point a beginning of the work of organization resulting from the adhesion and fusion of the scarified points with the corresponding points of this surface. Then in order to circumscribe and imprison the luxated extremity, in this place of election, I practice all about deep scarifications, which tend to excite the same work of organization and to establish fibro-cellular adhesions between the incised borders of the capsule and the contiguous bony surfaces. When the fibro-cellular adhesions are supposed to be sufficiently solid to resist the movements of the new articulation, I provoke, little by little, the development of the cavity destined to embrace the luxated extremity by the means which nature herself employs in analogous circumstances; that is to say, by circumscribed and frequent movements of this articulation."

This treatment, to be successful, should be commenced as early as possible, no examples of success having been reported in

parsons over fifteen years of age; while the youngest child w
treatment is reported as successful was only three years of

The apparatus recommended by Davis and applied to the
in the same manner as directed in Coxalgia, page 97, seem
fulfill all the indications of cure. In a case treated by Davis
elastic extension was applied to the limb, in a girl of fou
years of age, by a weight of eight pounds. He says: "
three weeks the limb was frequently abducted as far as wou
permitted without removing the extending force, while at
same time one hand was placed above the trochanter, pressi
downward and inward, while the limb was steadily brought
extended position. The precise time when the head came
the acetabulum we are unable to say; the soft tissues elong
gradually, the restoration of the joint was without any m
feature to denote it. From this time we are not aware tha
head left the acetabulum. When the weight was removed
few minutes, the limb remained in its natural position, bu
patient was not allowed to rest any weight upon it. It is al
certain," says he, in conclusion, "that the entire limb will be
as perfect as the other."

The length of time required to effect a cure, in cases wh
cure is possible, will vary according to the health of the pa
the age, and the pathological condition of the joint, and
embrace a few months or as many years. In cases where the
is extended over a space of two or three years, it is unneces
to state that the treatment must be intermittent and gr
varied, so as to suit all the changing circumstances in the co
tion of the patient. In such cases, where after a fair trial to
a cure, failure is evident, or in those conditions where eve
attempt at cure is not warranted, we should seek as
as possible to prevent an increase of the trouble by such m
as the nature of the case and our own ingenuity may sug
The apparatus of Desault, Dupuytren and Davis, for these def
ities, present many recommendations to which the attention o
surgeon may be profitably engaged.

SECTION II.

DISLOCATIONS OF THE KNEE.

In view of the peculiar anatomical structure of the knee oint, the articulating surfaces being broad and irregular, the igaments numerous and powerful, and the joint otherwise trengthened by the extensor and flexor muscles and the patella, lislocations in any direction are of exceedingly rare occurrence.

Luxations may, however, occur in four principal directions, namely, *backwards*, *forwards*, *inwards* and *outwards*. The ibia may also be thrown in the direction of a diagonal between hese points, that is, antero-laterally, or postero-laterally. They may be either complete or incomplete. The displacements ackwards and forwards may be complete or partial, while the ther varieties, owing to the great extent of the articulating urfaces laterally, and the immense force required to rupture the umerous ligaments, are always partial.

Etiology.—Considered as a strictly traumatic injury, the causes which conduce to the production of a displacement of the tibia, onsist, almost invariably, of the application of extreme violence o some portion of the limb in the immediate vicinity of the rticulation; simple flexion and extension, however forcibly pro-uced, being rarely capable of effecting dislocation in any direc-ion. Luxation, as a result of disease in the articular extremity f the bones, or of the soft structures entering into the formation f the joint, is occasionally met with; a case very recently came nder my care, in which, owing to previous mismanagement, here was complete luxation of the tibia, forwards, consequent on iseased action.

Backwards.—In dislocation backwards, behind the condyles f the femur, the limb is shortened, the condyles in front are pro-rudent and prominent, the ligament of the patella is depressed, he leg bent forwards from the line of the axis of the femur, he popliteal muscle is pushed back, and the popliteal vessels nd nerves are compressed by the head of the tibia; in conse-quence, the pain becomes excessive. The leg has the appear-nce of being slightly rotated, and is shortened considerably,

Fig. 285.

though less so than in dislocation forwar being at one time in a state of flexion, and another, in a state of extension, therefore definite rule can be laid down as to its posit Fig. 285.

Forwards.—The head of the tibia is pus upwards and forwards in front of the condy the leg somewhat twisted, the patella occupie sulcus in front of and above the tibia, and readily lifted up with the thumb and finge relaxation of the tendons of the exterior musc with shortening of the leg from one to inches; the condyles of the femur project ba wards and form a prominent tumor, and gre compress the vessels, so as to inter the circulation in the lower part of leg. The two dislocations are compl Fig. 286.

Fig. 286.

Inwards.—The internal condyle the femur rests upon the external se lunar cartilage, having been thrown the corresponding condyle of the ti the tibia projecting plainly on the in side of the knee, the width of the j being greatly increased.

Outwards.—In this luxation, signs are reversed, the tibia projec at the external aspect of the joint, and the condyle at the in The leg, in both cases, is slightly flexed and rotated on its a the extensor muscles are relaxed, and the width of the joint gre increased. The lateral luxations are incomplete.

Pathology.—There is extensive laceration of the ligament the joint, and more or less injury sustained by other soft pa The muscles upon the posterior and anterior aspect of the th if the luxation is complete, are put upon the stretch, and the h of the tibia is found to occupy either a position upon and pa behind the articulating surface of the femur, or upwards forwards in front of the condyles.

Treatment.—Having administered an anæsthetic, extension and counter-extension, aided by pressure against the protruding bone towards its normal position, will effect reduction without difficulty. Owing, however, to the extensive injury necessarily inflicted upon the soft structures of the joint, the after-treatment is to be conducted with the greatest care. The limb should be placed in an easy position and maintained perfectly at rest, the inflammatory action being actively combatted on the general principles already given. As anchylosis is the great danger to be apprehended, passive motion is to be employed in due time, without producing acute pain, and the strength and tone of the joint subsequently promoted by friction, cold douche, electro-galvanism, and stimulating local applications. The remedies of most value are *Aconite*, *Arnica*, *Ammon. carb.*, *Bryonia*, *Rhus* and *Ruta*, which should be given according to circumstances. If the dislocation is compound, the same treatment will be pursued as in simple cases; the wound should be carefully washed, and all extraneous matter removed with the expectation of bringing about union by first intention.

Arnica should be applied internally, provided the constitutional symptoms demand it, and externally in the form of a lotion, by saturating a compress of old linen with the remedy, and applying it gently and loosely over the parts, constantly wetting it as fast as it becomes hot and dry, until the pain abates. If there should be much constitutional excitement, *Aconite* should be given every hour or two, until the fever subsides. A lotion of *Aconite* to the limb will be of great advantage if the pain continue violent and the inflammation is acute, which should be continued, both internally and externally, until the inflammatory symptoms have subsided.

Rhus, *Ruta*, *Ammon. carb.* and *Bryonia* are valuable after the more active symptoms have been relieved, and there remains behind, subacute or chronic inflammation in the articulation.

§ 2.—DISLOCATION OF THE SEMILUNAR CARTILAGES.

This accident, originally described by Mr. Hey, of Leeds, and since carefully investigated by Sir Astley Cooper and others, "essentially consists in the partial removal of the semilunar car-

tilages from their natural position, allowing them to bec
wedged in between the tibia and femur, simply in consequenc
their ligamentous connections."

The usual cause conducing to the production of this var
of "internal derangement of the knee-joint," is a sudden
forcible wrenching of the foot, or the striking of the latter aga
an obstruction, while the toes are strongly exerted and the k
somewhat flexed.

The symptoms accompanying this form of luxation
always so well marked as readily to indicate the true characte
the injury. Immediately after the action of the exciting cau
the patient is seized with intense, sickening pain, often caus
him to fall suddenly to the ground; he loses all control of
the limb, being unable to sustain the least weight upon it, o
move it even. The leg is semi-flexed upon the thigh, and
attempts to extend it are attended by excruciating pain. In
course of two or three hours, considerable swelling supervei
and owing to the excessive deposit of synovial fluid, there occ
a distinct sense of fluctuation, and symptoms of subacute sy
vitis are thus rapidly superadded to the original injury. The
vere pain experienced in consequence of the accident, is due to
pressure sustained by the displaced structures between the arti
lating extremities of the femur and tibia, together with a stret
ing of the ligaments of the joint.

Treatment.—As all motion of the limb is productive of ac
suffering, the patient should be etherized before commencing
operation, after which flex the thigh upon the pelvis, then plac
the forearm in the bend of the knee, grasp the lower portion
the leg, and rapidily effect flexion and extension, combining
latter motion with a slight rocking or twisting of the joint. By t
triple movement the pressure of the condyles is taken off from
semilunar cartilages, and the parts are enabled to return to th
natural situation. Not infrequently, however, the patient
enabled to effect replacement himself; while in some cases
difficulty is overcome immediately after the occurrence by so
accidental manipulation, when the patient walks off as well
though nothing had happened.

In the more severe cases, the joint should be kept at rest fo

few days, *Aconite* and *Rhus* or *Ruta* lotions applied to the part, and the knee subsequently dressed with a laced knee-cap, as the displacement is extremely liable to recur from the slightest causes.

§ 3.—COMPOUND DISLOCATIONS OF THE KNEE.

This constitutes a variety of injury occasionally coming under the observation of the surgeon, and in view of the serious consequences likely to ensue, is one that is always approached with no little misgiving. Sir Astley Cooper regarded this injury as one especially demanding amputation, owing to the fact that an immense majority of the cases terminate fatally in consequence of the supervention of tetanus, traumatic fever, pyemia, or exhaustive suppuration. Concerning the formidable character of this accident, Dr. Gross writes: "I am satisfied that there is no class of lesions more dangerous to both life and limb than compound dislocations of the knee, especially when at all severe; and I, therefore, do not hesitate to recommend the prompt adoption of decisive measures. Where the soft parts are not too much affected, resection may advantageously be substituted for amputation, though in general, the latter is unquestionably the safer procedure."

Resection.—When the soft parts are not too much affected, this procedure may be resorted to in lieu of amputation, but of the two operations, I think amputation is by far the more successful and unquestionably the safer procedure.

Though I am confident that the administration of appropriate Homœopatic remedies in combatting the complications likely to arise, is capable of accomplishing more brilliant results in these cases than is claimed for the most approved Allopathic treatment, still, I am forced to acknowledge in view of my own experience, that in all cases of a severe nature, amputation, or at least resection, should be resorted to without delay. In the less severe cases, when the surgeon may be justified in his attempt to save the limb, he should resort to the means and measures already given in the treatment of Contused and Lacerated Wounds, vol. 1, page 638.

§ 4.—DISLOCATIONS OF THE PATELLA.

Dislocations of the patella are not common. The displacement is generally the result of violence or muscular action, in knock-kneed persons, and may occur in four directions: *inward*, *outward*, *vertically*, and *upward*; dislocation downward being practically impossible owing to the manner in which the patella is imbedded in the tendon of the quadriceps extensor muscles. The luxation upward, is of extremely rare occurrence, Erichsen, Gross and others, affirming that it "can only occur as a consequence of the rupture of its ligament." Heister and Ravaton, however, have each recorded a case in which the displacement existed as a result of a relaxed and elongated condition of the ligamentum patellæ, the bone being drawn upward to the extent of three inches.

1. Dislocation *outwards*, is the more common of the lateral displacements, and is occasioned in the majority of cases by violent muscular contraction, especially in persons who are knock-kneed. It has also been produced by direct mechanical violence.

The symptoms are well defined. The leg is slightly flexed upon the thigh, or is painfully extended, in either case immovable; the patella can be distinctly felt on the outer aspect of the knee, its outer edge looking backwards, and the inner forwards while the inner condyle of the femur can be distinctly felt under the skin and projects unnaturally inwards, thus giving the joint the appearance of being considerably increased in width. There also exists a deep depression in the original site of the bone; there is severe pain; and rapid swelling ensues, due to serous effusion within the joint. Fig. 287.

Fig. 287.

Treatment.—The patella being held in its abnormal position by the action of the extensor muscles, the apparent indication is to relax as much as possible the quadriceps femoris. This is best accomplished by seating the patient with his body inclined forwards, while the surgeon extends the leg upon the thigh, and flexes the limb upon the pelvis, by resting the ankle upon his shoulder. This procedure will alone

often be quite sufficient to effect the restoration of the bone; but if not, the operation is to be completed by making pressure upon the patella with the thumb and fingers from without inwards.

2. Dislocation *inwards*, generally results from blows expending their force upon the outer margin of the patella, and presents a group of symptoms the reverse of those enumerated as peculiar to the displacement of the bone outwards. The situation of the patella is reversed, its outer border is turned forwards while the inner looks backwards. The leg is extended and cannot be flexed; the outer condyle is depressed and a characteristic prominence exists on the internal aspect of the knee. Fig. 288.

Fig. 288.

Reduction is to be accomplished in the same manner as in the former luxation. Provided, however, the method described does not prove successful, the bone is to be disengaged from its firmly impacted position by rapidly and forcibly flexing and extending the leg.

3. Dislocation *vertically*, or the turning of the patella edgewise upon its long axis, is a very remarkable as well as an exceedingly rare accident. And, as it has been tersely remarked, "it is indeed difficult to conceive how a bone, which is so firmly imbedded as this, in a tendinous matter, can lend itself to such a freak, which has the effect of turning it completely on its side, so that its outer edge lies immediately under the integuments in front of the knee, while the inner rests in the subcondyloid fossa of the femur, being firmly and almost immovably wedged in its new position, the anterior face looking inwards."

In some cases the patella is turned almost completely around, the posterior surface presenting anteriorly. Comparatively few, not more than fourteen or fifteen cases of this injury have been recorded.

The symptoms of this displacement are well marked, the edge of the bone forming a sharp, prominent ridge in front of the joint with a deep depression existing on either side. The limb is rigidly extended or only moderately flexed, the extensor muscles being exceedingly tense.

The reduction is commonly attended with great difficulty. In the case of Dr. Wolff, the ligament below, and the tendon above the bone, were both divided, without facilitating the replacement. Excessive suppuration ensued, the case terminating fatally. Dr. Watson, of New York, effected reduction in the example coming under his observation, as follows: "With the leg extended, and the anterior muscles of the thigh forced forwards as much as possible, pressure was made upon the patella with the expectation of forcing down its prominent edge. The effort was followed only by an increase of pain, the bone remaining permanently fixed. Another attempt was made to cant its posterior edge inwards, and to bring its anterior edge outwards, without pressing it against the condyles of the femur, by forcing the head of a key against the posterior, now the outer face of the patella (using this as a fulcrum), and pressing the prominent edge of the bone toward the outer condyle. This manœuvre gave him no pain, but was as fruitless in its result as the other. At length the knee was forcibly bent and immediately straightened again; and then by canting the patella as before, and pushing it slightly downwards and inwards, it sprung with a sudden snap into its proper position."*

Dr. I. P. Gazzam, of Pittsburg, Pa., met with a similar case, and after having failed in repeated trials by lifting the limb towards the body and by pressure in opposite directions, determined to divide the ligamentum patellæ by a narrow-bladed knife introduced subcutaneously and cutting close to the tubercle of the tibia. The reduction was as unsuccessful as before. He then determined to adopt the method with some modification, practiced so successfully by Dr. Watson, and on the fourth trial succeeded in restoring the bone to its normal position, the patella springing into its place with a distinct snap. Recovery was uninterrupted, and in two or three months the patient gained the complete use of his limb.

Treatment.—The treatment in these cases will be the same as heretofore recommended in inflammations of the joint after reduction of the bone has been effected, and consists in the inter-

* New York Med. Journ., Oct. 1839, p 302.

nal use of *Aconite*, *Arnica*, *Rhus* or *Ruta*, and the same remedies applied externally as hitherto advised under such circumstances.

SECTION III.

DISLOCATION OF THE FIBULA.

Dislocation of either the upper or lower extremity of the fibula may occur in consequence of violent mechanical force, though the accident as an uncomplicated lesion is extremely infrequent.

§ 1.—DISLOCATIONS OF THE SUPERIOR EXTREMITY OF THE FIBULA.

Displacement of the superior extremity of the fibula may occur *forwards* or *backwards*. The well-authenticated cases of this character have been collated by Prof. Hamilton, and in the example of displacement *forwards* reported to him by J. E. Hawley, of Ithica, N. Y., the following symptoms were observed: The right leg was semi-flexed and immovably fixed. The head of the fibula was plainly felt in front of its natural position, near the ligametum patellæ. The patient was suffering the most intense pain. Extension and counter-extension were made, and while the doctor was pressing with both of his thumbs upon the head of the fibula, it went into its place with an audible snap. The relief was instantaneous. Complete rest was observed for a few days, while cooling lotions were constantly applied, and within a week he was able to attend to his usual duties.

Of dislocation *backwards*, but one example is recorded. This came under the observation of Dubreuil, who effected reduction by flexing the leg, and exerting pressure upon the head of the bone, forwards. In this case, the head of the fibula was thrown backwards, forming a marked prominence under the skin, the foot was drawn outwards, and the outside of the limb became cold and numb. After replacement, the knee was covered with a leather cap, secured moderately tight. After twelve days of rest, gentle motion was begun, and on the seventeenth day, the patient walked with the assistance of a cane. For some time the leg tended outwards, but in three months the cure was effected.

§ 2.—DISLOCATION OF THE INFERIOR EXTREMITY OF THE FIBULA.

The only well-marked case of this accident is reported by Nelaton, of Paris, as coming under the care of M. Gerdy, and presented the following symptoms: The lower extremity of the bone closely approached the outer margin of the tendo-Achillis; the articular surface of the astragalus, naturally occupied by the fibula, could be plainly felt, while the foot retained its natural position. As nearly six weeks had elapsed since the accident, no effort was made to effect reduction.

Boyer, however, relates a case in which both extremities of the fibula were dislocated simultaneously, being also complicated with an outward luxation of the foot. Such an accident implies extensive laceration of the interosseous ligament by a blow or fall, drawing the bone upwards and outwards.

Treatment.—Reduction is readily accomplished by flexing the leg at a right angle with the thigh and pushing the bone back in a direction contrary to that of its displacement. The limb should be maintained at rest for a considerable time, and a broad, elastic strap with a closely fitting pad applied over the head of the bone.

Aconite, *Arnica*, *Ruta*, or *Rhus* lotions may be advantagously employed throughout the conduct of the case to subdue inflammatory excitement and to bring about union of the lacerated structures.

SECTION IV.

DISLOCATION OF THE ANKLE.

Dislocation of the ankle joint consist in a displacement of the astragalus from the bones of the leg, while it retains its normal relations respecting the other bones with which it articulates. The accident, however, is exceedingly rare, as one would readily infer from a consideration of the structure of the articulation. Thus, the broad articular surface on the superior portion of the astragalus is received into an arched cavity, formed by the projection of the external and internal malleoli, which, in consequence of their remarkable length and width, afford powerful resistance to lateral luxation, while dislocation either forwards or back-

wards seems equally impracticable, owing to the great strength and firmness of the ligaments and tendons guarding the articulation in these directions. Indeed, dislocation of the astragalus, unaccompanied by fracture of the tibia or fibula, is an accident of such extremely rare occurrence, that it has been suggested that "most of them should be viewed in the light rather of fractures of the tibia and fibula, with displacement of the astragalus, than as dislocations, properly so called, of the ankle joint."

Concerning the nomenclature of these lesions the student should be apprised of the fact that Sir Astley Cooper and some other writers regarded the bones of the leg as the displaced members, while Boyer and others have considered the foot as the part displaced, and hence the same lesion has been described by different authors in directly opposite terms.

Varieties.—The ankle is liable to be luxated in four directions; thus, the astragalus may be thrown forwards, backwards, inwards and outwards.

§ 1.—DISLOCATION OF THE ANKLE JOINT FORWARDS.

Dislocation Forwards has been very seldom met with. It may result from force applied at the heel while the foot is flexed upon the leg and the body inclined forwards, the force impinging upon the fore part of the joint. The tibia is thus thrown behind the astragalus to occupy a position in the upper and posterior surface of the os calcis.

Symptoms.—The foot is considerably lengthened, the heel shortened, and the hollow on either side of the tendo-Achillis is obliterated in consequence of the presence of the lower extremity of the tibia. Fig. 289.

Fig. 289.

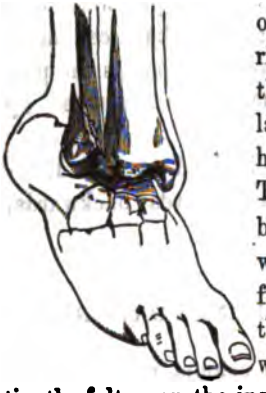
In order to accomplish **reduction**, the tendo-Achillis is first to be relaxed, by flexing the leg upon the thigh, when the foot and lower part of the leg are to be forced in opposite directions, the foot backwards and the tibia forwards.

§ 2.—DISLOCATIONS OF THE ANKLE JOINT BACKWARDS.

Dislocation backwards results from violence exerted on the ball of the foot while the latter is strongly extended upon the leg, the knee, at the same time being in a state of extreme flexion. It may also be occasioned by the fall of a heavy weight upon the posterior and lower part of the leg, the parts being in the same position; or even from violent extension of the foot.

Symptoms.—The fibula is commonly fractured in a level with the articulation, and in consequence of the advance of the tibia upon the anterior portion of the astragalus and upon the scaphoid, or resting wholly upon the latter bone; the foot is shortened, and the heel correspondingly increased in length. The heel is also drawn upwards and flexed by the contraction of the tendo-Achillis, which stands boldly out and slightly curved forwards. The toes point downwards, their extensor tendons being prominent, while the extremity of the tibia can be distinctly felt upon the instep. Fig. 290.

Fig. 290.



Treatment.—The reduction is to be accomplished in essentially the same manner as in the previous luxation; that is, by flexing the leg, making extension from the foot, at the same time exerting pressure upon the front of the tibia and upon the heel. So soon as movement of the bone commences, the foot should be forcibly flexed upon the leg.

The after-treatment consists in placing the leg in a box, and supporting the foot by means of a foot-piece placed at right angles with the line of the tibia. Care must be taken to protect the heel, by resting it upon a mass of cotton, or, what is better, by suspending it by means of a band, fastened to the top of the foot-board. It may also be found necessary to make pressure upon the extremity of the tibia, which is to be effected by employing compresses of some soft material, applying the same over a large surface, and confining them by a band, passing through

openings on either side of the box. Medicated lotions are to be employed, according to the circumstances of the case, as previously recommended.

§ 8.—DISLOCATION OF THE ANKLE INWARDS.

Professor Hamilton states it as his opinion that "a large majority of those accidents which have been called inward and outward dislocations of the tibia, were merely examples of lateral rotation of the astragalus within the half-ginglymoid and half-orbicular socket, formed by the lower extremities of the tibia and fibula; and that true dislocations, either partial or complete, are, at this joint and in these directions, very rare occurrences."* The question, however, whether the astragalus is only rotated upon its axis, or actually thrown laterally from its connections with the tibia, seems, in a practical point of view, to be of comparatively little moment, as in either instance, the external deformity is ordinarily the same, while the means capable of effecting restoration in one case will generally be found applicable in the other.

The *causes* likely to produce an inward displacement of the astragalus, are violent wrenches of the foot, and falls or blows upon its plantar surface, giving the bone an impulse inwards. The accident is also possible in consequence of the parts being compressed between two opposing surfaces, as for example, when it is caught between cars, or by the passage of a carriage-wheel over it.

Symptoms.—The foot is adducted to a greater or less extent, its outer border resting on the floor, while the inner is proportionately elevated; the external malleolus is remarkably prominent, a corresponding depression existing on the inner aspect of the ankle. The astragalus can be felt in its new position; the patient suffers severe pain; while he is unable to move his foot in any direction, except by grasping it in his hand, when it will be found susceptible of considerable motion.

* Op. Cit., p. 674.

Fig. 291.

Fig. 291. There is commonly a fracture also of the internal malleolus.

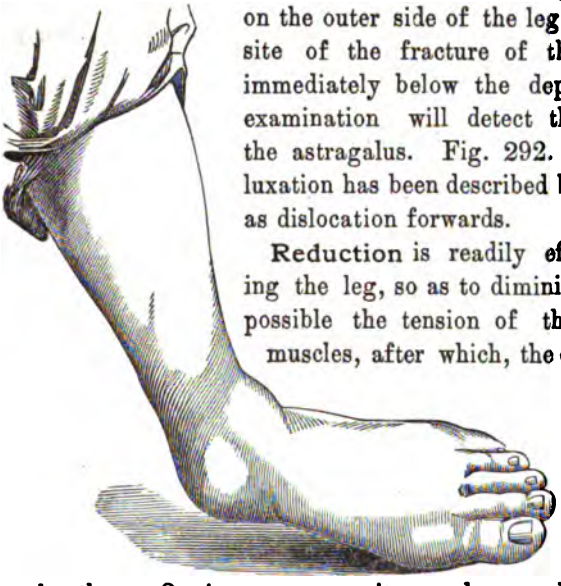
Treatment.—The leg should be flexed at a right angle with the thigh, in order to relax the tendo-Achillis, and steadied in this position by an assistant, while the surgeon, holding the foot midway between flexion and extension, exerts traction upon it, at the same time pressing laterally upon the astragalus. In applying extension, the operation may sometimes be facilitated by giving the foot a slight rocking motion. The parts are subsequently to be kept quiet and in position, by applying a side splint upon either side of the ankle; medicated lotions continually applied as before recommended.

§ 4.—DISLOCATION OF THE ANKLE OUTWARDS.

Dislocation outwards is the most frequent of the varieties of luxation peculiar to the ankle joint. It is commonly produced by a twisting of the foot, or by direct violence. Fracture of the lower fifth of the fibula almost invariably complicates the accident together with severe laceration of the ligaments. It not infrequently happens also that both the internal and external malleoli are broken, thus permitting the astragalus to assume a position between the fractured extremities of the tibia and fibula.

The **symptoms** are characteristic. The inner border of the foot rests upon the floor, while there is a corresponding elevation of its outer margin. A marked projection is formed on the inner side of the joint, by the abnormal position of the malleolus,

Fig. 292.



there being, on the contrary, a depression on the outer side of the leg, indicating the site of the fracture of the fibula; and immediately below the depression manual examination will detect the presence of the astragalus. Fig. 292. This form of luxation has been described by most authors as dislocation forwards.

Reduction is readily effected by flexing the leg, so as to diminish as much as possible the tension of the gastrocnemii muscles, after which, the displaced members are to be pressed into position, by drawing the articulating surfaces towards each other. Or, in some cases, it may be required to produce moderate extension of the foot, at the same time slightly flexing and extending the limb.

The parts are then to be retained in their proper place by side splints and adhesive strips, and the joint continually wet with the medicated lotions previously advised in such cases. Passive motion should be instituted as soon as circumstances warrant. The joint is disposed to continue weak for some time, and in some cases, under the most careful attention of the surgeon, motion will be more or less impaired.

§ 5.—COMPOUND DISLOCATIONS OF THE ANKLE.

Compound dislocation of this joint is always a grave accident, endangering both life and limb; and, provided, the large vessels and nerves of the part are seriously implicated, or there exists severe comminution of bone, accompanied by extensive injury of the integuments, no doubts respecting the propriety of amputation are to be for a moment entertained. In the less serious cases, however, much is to be expected from excision of the protruding bone, which, together with the subsequent use of

Calendula, with appropriate internal medication to prevent excessive suppuration, and to relieve accompanying derangements, the most successful results may often be attained.

SECTION V.

DISLOCATIONS OF THE BONES OF THE FOOT.

Owing to the comparatively limited motion of the bones of the foot, the peculiar arrangement respecting their articulation, and the strength and firmness of their ligaments, examples of dislocations of the foot rarely come under the observation of the surgeon. When occurring, however, they are ordinarily accompanied by complications of so violent a nature as often to demand immediate amputation.

§ 1.—DISLOCATIONS OF THE ASTRAGALUS.

It is to be premised that what is properly termed "dislocation of the astragalus" is a lesion very different in its pathological character from a simple displacement of this bone from the arch formed by the inferior extremities of the bones of the leg. In the latter instance, which accident has been designated as "dislocations of the ankle," the normal relations of the astragalus are destroyed with the tibia and fibula only, whereas in the former case, the bone in addition is also displaced from its articulations with the os calcis and scaphoides, thus causing it to abandon all its original connections.

Varieties.—The astragalus may be dislocated directly forwards and backwards, though the accident is usually attended by more or less displacement laterally. Dislocation *forwards* is, however, by far the most frequent, being generally accompanied by a deviation of the bone either inwards or outwards, with twisting of the foot.

Of the dislocations *backwards* only seven cases are recorded, while I am not aware that a single instance of complete lateral displacement has occurred independent of luxation antero-posteriorly.

The *causes* conducing to this accident are principally falls or wrenches of the foot. Provided the force be applied to the

extremity when the foot is strongly extended, fracture of the tibia is very apt to occur and thus complicate the case. The particular direction of the displacement will, of course, depend upon the direction in which the force acts as well as upon the degree of adduction, abduction, flexion or extension of the foot at the time of the accident.

Symptoms.—When the astragalus is thrown in front of its natural position, the nature of the accident can be readily determined by the remarkable prominence upon the instep, where the peculiar form of the bone can be distinctly felt, and over which the integuments are so firmly drawn that ulceration and sloughing rapidly supervene unless reduction be at once effected. In this event, the exposed parts of the bones would also be likely to undergo necrosis, and ultimately, exfoliation. The foot may be forcibly flexed or extended; shortening of the leg results in consequence of the tibia resting upon the os calcis; swelling speedily ensues and may seriously obscure the diagnosis. In the dislocation backwards, the astragalus is thrown behind the ankle, resting upon the superior surface of the calcaneum where it forms a large characteristic prominence. The tendo-Achilis is severely put upon the stretch and thrown backwards by the displaced bone; the skin covering the heel is violently stretched, the muscles of the leg are rigid, the tibia is slightly canted forwards, and the instep seems a little shorter than natural, and there is a slight depression in front of the joint. The tibia and fibula are often both fractured.

Prognosis.—It is evident from a consideration of the structure of the joint that complete displacement cannot occur without the exhibition of violence and mechanical force; and hence, the danger of intense inflammatory action is correspondingly great.

The most serious terminations have even been observed in cases where restoration of the parts has been promptly effected. Comparatively little, therefore, can reasonably be expected from the most judicious management in those instances in which reduction is effected, if at all, only by the most severe and protracted efforts. In some cases, however, the reduction has been accomplished without difficulty and the functions of the part in a great measure restored.

Treatment.—It is impossible to prescribe a line of treatment that shall be equally applicable in all of these most unfortunate cases. This must be apparent in view of the fact that the accident is attended by a great variety of complications, while the bone itself is exceedingly varied as regards the position it assumes, being liable, in addition to the several directions of its displacement, to be more or less rotated upon either its long or short axis and hence the difficulty of establishing a definite classification. Provided, however, the dislocation be partial, the most persevering efforts to effect reduction should be made, by employing traction, pressure, and if necessary subcutaneous division of whatever ligaments or tendons that offer marked resistance. In dislocation forwards, the surgeon should direct an assistant to make extension by grasping the dorsum of the foot with one hand and the heel with the other, while another assistant makes counter-extension at the knee, having it bent at a right angle with the thigh, the operator himself making firm pressure upwards and backwards upon the head of the astragalus.

But in case the reduction be impossible, the tension of the parts is to be relieved by subcutaneous sections, and the subsequent inflammation perseveringly combatted. Notwithstanding every precaution, however, the integuments will be likely to slough, thereby exposing more or less of the osseous structures, which are to be excised, as otherwise necrosis will inevitably follow.

Gross recommends that, "when the bone is entirely displaced, lying immediately beneath the integuments and muscles of the instep," that the surgeon practice immediate excision, placing the ends of the tibia and fibula in the sulcus vacated by the removal of the astragalus.

In dislocation of the astragalus *backwards*, the reduction may be regarded as impracticable. Erichsen states, however, that one case occurred in the University College Hospital, complicated with fracture of the tibia and fibula, in which replacement was accomplished, suggesting in the same connection that the operation might be materially facilitated by subcutaneously dividing the tendo-Achillis.

The cases coming under the observation of Lizars, Liston, Phillips, Nelaton, and Williams, all proved irreducible.

Compound dislocations of the astragalus will almost invariably demand immediate amputation, or, at least, exsection, the choice of the operation to depend upon the severity of the lesion and the condition of the patient. Provided the injury be extensive or the health impaired, there is no question as to the propriety of amputating either through the foot, or at some convenient point above the ankle, whereas if the patient be in robust health, excision may be practiced with hope of success.

The *after-treatment* is to be conducted upon general principles, recollecting that in case the contusion and laceration be severe, as they generally are, not to close the wound closely by the use of sutures and plasters, as the subsequent effusions being thus confined would lead to greater inflammatory action than would otherwise occur. Medicated lotions of *Arnica*, *Rhus*, *Ruta* or *Calendula*, according to their respective indications, are to be continuously applied to the part and internal remedies given as demanded. If *erysipelas* should supervene upon the injury, as in severe cases it is exceedingly prone to, it should be treated upon the same principles laid down under that head.

§2.—DISLOCATION OF THE TARSAL AND METATARSAL BONES.

1. The *tarsal bones* are rarely luxated, the astragalus being the one that is generally displaced. Professor Hamilton, has, however, collated several instances of what he is pleased to term "*atragalo-calcaneo-scaphoid dislocations*" in which the os calcis and scaphoides were thrown from their natural relations with the astragalus, the latter bone retaining its connections with the tibia. Reduction was impracticable, and in the case treated by Dr. Detmold, it eventually became necessary to practice amputation of the leg. In another case, reported by Dr. Wells, the astragalus was finally extracted and the patient recovered without any untoward results except a slight shortening of the limb.

The *calcaneum* may be luxated from its articulations with the astragulus and from the cuboid bone in consequence of violence applied to the heel. Chelius has seen an example which resulted from pulling off a boot.

Two other cases of this accident were originally reported by South and afterwards mentioned by Sir Astley Cooper, in which

reduction was readily accomplished and the functions of the part regained.

The *scaphoid and cuboid* may be displaced from the astragalus and os calcis, the accident presenting a somewhat singular deformity, the foot being shortened and twisted upwards and inwards, so as closely to resemble varus. The reduction is to be effected by holding the heel firmly and drawing the toes outwards aiding the replacement by pressure.

The *cuneiform* bones are sometimes partially displaced without being separated from each other; more commonly, the internal one is luxated singly. In this event, there is a marked prominence on the inside of the foot, together with a slight degree of elevation of the bone, owing to the action of the tibialis anticus. Pressure will commonly suffice to accomplish reduction. To prevent a return of the displacement, compression is to be maintained, by the application of adhesive strips, compresses and a roller.

2. *Dislocation of the metatarsal bones* is an accident that sometimes occurs, examples being recorded by Dupuytren, Smith, Malgaigne and others. A case of complete dislocation of all the metatarsal bones was communicated to Dr. Gross, by Dr. Green, of Easton, Pennsylvania. Reduction was effected by employing extension, aided by lateral pressure. In the other forms of luxation, in which the bones are displaced singly, no difficulty in restoring them tc their natural position will ordinarily be experienced.

3. Dislocations of the phalangeal and metatarso-phalangeal articulations are occasionally met with, and are easy of reduction; though they are often of such a complicated character as to demand removal. Dislocation of the great toe at the metatarsal joint is an exceedingly rare accident, and is easily recognized. The toe inclines somewhat outwards, and lies a little higher than the sound one, being quite a half inch shorter than its fellow. The head of the first phalanx rested upon the dorsal surface of the anterior extremity of the metatarsal bone, where it formed an abrupt, well-defined prominence. The adductor longus formed a broad, tense cord at the inner side of the foot, which disappeared after reduction was effected.

Treatment.—Placing the patient under an anæsthetic, apply a clove-hitch to the toe, and making the extension forwards and a little downwards, the head is disengaged from its situation and steadily drawn into its place. Counter-extension is made by an assistant firmly grasping the ankle. The same general rules for correcting this deformity may be applied that are given for luxations of the metacarpal and metacarpo-phalangeal articulations.

PART XVII.

FRACTURES.

CHAPTER I.

GENERAL CONSIDERATIONS.

There is no class of injuries that demand of the surgeon a greater amount of skill, self-reliance, or more mechanical ingenuity than that of the successful treatment of fractures. Often of difficult diagnosis, and extremely troublesome to manage, they constitute, says Gross, the most trying, perplexing part of surgery to practice creditably and successfully. As for myself, he adds, "I never treat a case of fracture, however simple, without a feeling of the deepest anxiety in regard to the ultimate issue; I cannot retire at night or rise in the morning without a sense of discomfort, so long as I am conscious, that, despite my most assiduous attention, and my best directed efforts, my patient is likely to become deformed and lame for life." With such an appreciation of the difficulties and perplexities that surround this subject, as enunciated by this great surgeon, it is not a matter of surprise that so many crooked and ill-shaped limbs stare at us on every side. With the greatest care and attention of the practitioner, and with the most consummate knowledge of anatomy that he may possess, it nevertheless sometimes happens that an unsightly limb is the result of his most careful manipulation. It should be the aim of the surgeon, therefore, in every case, to call to his aid all the skill, anatomical knowledge, and mechanical ingenuity in his power, to effect a result not only gratifying to the patient, but creditable to the profession.

This can only be effected by the most attentive and scientific consideration of each individual case, with a thorough knowledge

of the anatomical situation of implicated parts, and skillful management of the patient throughout. Even under the most favorable circumstances, cases will arise which are almost impossible to cure without some deformity or impairment of function. Experience teaches us, that in those severe and complicated fractures involving joints, such unfavorable results will sometimes follow, notwithstanding the greatest care and skill of the surgical attendant. Our great aim should be, however, to make these unfavorable results as few as possible, and by the large number of successful and creditable cures, largely overshadow the evil by the good. In this way, surgery can be lifted beyond the power of injury from designing men, and cases of malpractice rendered few and far between.

When a case terminates unfavorably, even in the hands of the most skillful surgeon, sometimes, the friends of the patient, tempted either with cupidity or revenge, cannot find language too harsh, or denunciations too severe, to injure the professional standing of the medical attendant, though he may not be deserving of blame. The community are too apt to judge of a surgeon's ability by the result of a single case; that is, if it terminates favorably, he has achieved a "good cure," but if the limb be deformed, it is imputed to want of skill, inattention, &c., &c. As a principle, nothing can be further from the truth, or be productive of more mischief, than this kind of "*post hoc, propter hoc*" reasoning. It is this hypothetical and irrational logic that fosters malpractice suits in our courts, and which so often among intelligent juries, compensates the plaintiff with the verdict of "one cent damages."

Etiology.—Fractures are of two kinds, *simple* and *compound*; the latter, however, is subdivided according to the character and extent of the injury, such as *comminuted*, *complicated* and *impacted*.

A fracture may be defined as a solution of continuity in the osseous tissue, and may be either transverse, oblique, or longitudinal. It is said to be *simple* when it is unaccompanied by any lesion of the soft parts, and *compound*, when a wound communicates with the fractured part. A *comminuted* fracture is that in which the bone is broken into a number of pieces. A

complicated fracture is when the injury is associated with hemorrhage, laceration of vessels or nerves, or other damage done to the surrounding tissues, and an *impacted* fracture signifies that the extremity of one fragment is forced into that of the other.

Causes.—The causes of fracture are divided into the *predisposing* and *exciting*.

Predisposing.—All those circumstances which render the bones more liable than usual to be broken, are termed predisposing causes. Among these may be enumerated, influence of age, which increases the brittleness of bones as we advance in life; the prolonged disuse of any limb; certain diseases, as cancer, syphilis, scurvy and rickets, gout and rheumatism; original conformation—the bones of some people being exceedingly brittle, without any appreciable cause.

Exciting.—The exciting causes of fracture are two-fold, mechanical violence and muscular contraction. The former is the most common and may act upon a bone *directly*, as when a fracture is produced at the part to which the violence is actually applied. It is said to be *indirect* when a force is applied to two portions of a bone at the same moment, the fracture taking place at a point between. This is exemplified by a fracture of the radius by falls upon the hand, or in a case of fracture of the clavicle by a fall upon the shoulder. In old people, the neck of the femur is frequently broken by stepping carelessly upon the floor, or by the merest twist of the limb in bed.

It is rarely that a bone is fractured by muscular action. Prof. Gross records three cases of this accident, in two of which the subjects were remarkable for health and muscular developments, and the fracture in each was produced by feats of strength, in which the elbows were held upon a counter, their hands interlocked, and the effort made by each to push the other's arm over upon the counter; in the third case, the arm was broken in the act of throwing a chip.

It occasionally happens that a fracture is partial, where a part only of the fibres are broken, the rest bending to the force. This is called the *green stick fracture*.

SECTION I.

SIMPLE FRACTURES.

The symptoms of fracture are divided into two classes—the *rational* and *physical*.

The rational are easy of recognition, and consist of pain, more or less acute, impairment of function and deranged sensibility of the affected limb, caused by pressure of the fragments upon the nerves of the part.

The *physical* symptoms are: 1st. *Crepitus*, or that peculiar grating sensation, produced by rubbing two broken extremities of bone against each other. The crepitus of fracture must not be mistaken for that *moist* crepitus which is the result of effusion of lymph into the surrounding tissues, or the presence of air in the areolar tissues; besides this, there are *præternatural mobility* and *deformity of the part*.

The amount of constitutional disturbance in fracture, depends upon its extent and the peculiarity of the individual, and varies from the slightest exaltation of normal action to the most intense excitement. In many cases, there is an entire absence of traumatic fever, while in others, all the functions of the body undergo marked and persistent derangement.

Prognosis.—The prognosis of fracture will depend upon the age, constitution and habits of the patient, his obedience to treatment, and the nature and extent of the injury.

As a rule, fractures in aged persons unite more tardily than in the young. The bone that is broken, and the line of the fracture influences, more or less, the result of the case; thus, fracture of single bones, as the femur and humerus, situated between large and powerful muscles, are more difficult to treat successfully and without deformity, than where it occurs in the forearm or leg, a single bone only being broken; since in the latter case the sound bone acts as a splint to keep the parts at rest, and prevent shortening.

The social position of the patient also influences the result; thus, the laboring classes, with strong and robust frames, do better *ceteris paribus*, than the wealthy, whose constitutions are often debilitated by intemperance and luxurious modes of living. The

relation of the fracture to certain cavities has its weight in the prognosis, hence fractures of the pelvic bones, in consequence of the viscera being affected thereby, are more serious in their termination than those of the extremities.

In all fractures, therefore, the prognosis should be guarded, as the result from serious and unlooked for causes may produce a consequence very different from that which was anticipated. Throughout the conduct of the case, the surgeon's duty is to foresee, if possible, threatening complications, and to bestow that skill and attention upon the patient that will result in a perfect cure as far as it is possible to be attained. If the result should be unfavorable, despite all such care and assiduity on the surgeon's part, he cannot equitably be held for any accountability in the matter. He alone should be answerable to the law, who is not only ignorant of the principles of treatment in such cases, but who is notoriously negligent of his patient's best interests.

Process of repair.—The first few days after fracture, there occurs a period of repose, with little or no change taking place, except, perhaps, the effusion of small quantities of serum and lymph, and the absorption of blood that may have been extravasated; pain subsides, and the tendency to spasmodic action disappears. Any traumatic fever that may have been present has yielded, and the parts are ready to take on the reparative process.

First stage or uniting period.—At the beginning of this stage, the ends of the broken bones, the periosteum and neighboring tissues are found to be abnormally red, injected with blood, and covered by plastic matter, resembling in consistence and appearance a thick solution of isinglass. It is most abundant upon the surface of the bones, but is effused between the periosteum and the muscles, and in the muscles themselves; all these structures being more or less actively engaged in the process of repair. A similar substance, but in less abundance, is thrown out within the medullary canal, the lining membrane of which is in a state of inflammation, as is evinced by the injection of its vessels and discoloration. This is the period properly known as the "knitting" period, during which, the patient feels a peculiar sensation which is popularly attributed to the "knitting" of the bone.

In the latter part of this stage begins the *period of development* or modeling process, in which the lymph is converted, first, into fibrous tissue, then into cartilage, and finally into bone; or, more correctly speaking, cells are developed by proliferation in the new substance, into which the osseous granules are deposited, the whole process resembling that in which bone is originally formed.

The traumatic irritation propagated from the broken bone causes swelling of the periosteum, active proliferation and formation of a sheath of new bone around the seat of fracture, which is termed the "*ensheathing*" or "*ring callus*" of surgical writers. The medulla at the same time participates in the action going on and becomes hardened and partly ossified, which constitutes the "*interior*" or "*pin callus.*" At this time, the osseous structure itself undergoes cell proliferation, and union of the fragments takes place by the same process already mentioned in considering wounds of the soft tissues. The new material which is developed between the ends of the broken bones by the osteogenetic layer of periosteum, is called the *intermediate*, *permanent* or *definite* callus, in contradistinction to the *ensheathing* and *interior* forms of callus, which are *temporary* or *provisional.**

The time required to complete this process, varies from four to ten weeks, being proportionately less as the patient is younger and healthier, especially so, if the fracture is nicely adjusted and kept at perfect rest. The last stage in the process of repair consists in the absorption of superfluous bone and the restoration of the medullary cavities, and is generally completed in from seven to twelve months. The material by which fractures are consolidated was called by the older pathologists, *callus*, in consideration of its density, which, when the process of repair is completed, is fully as hard as bone. Fig. 293.

If the ends are not accurately adjusted, the interspaces are

* Billroth, however, explains this process differently. According to this distinguished surgeon, the periosteum possesses no peculiar osteogenetic power, the formation of callus being due, not to proliferation of previously existing cells, but to an accumulation of *wandering cells*, which he considers as white blood corpuscles escaped from the vessels, and aggregating together so as to form bone.

Fig. 298.

filled up by this material as is shown in the cut. The figure also exhibits the formation of what is termed a *provisional callus*, that is to say, a ferrule of new bone, encircling both extremities for a little distance above and below, so as to splice them together until they can be more firmly held by the *ensheathing* or *permanent callus* as it is termed. The permanent callus becomes so by the absorption of its more superficial portions at first, and gradually the deeper, until the broken bone not only regains its pristine form and color, but also its smoothness, so that in a well-adjusted fracture nothing will remain to denote the existence of fracture, save a little seam or ridge corresponding with the line of junction of the two fragments.

It will thus be seen that the office of the provisional callus corresponds with the plasma effused between the cut surfaces of a wound, which disappears as soon as its office of firmly uniting the cut edges together has been accomplished.

In fractures that are perfectly adjusted and maintained in situ, there is little need of provisional callus, the ends of the broken fragments uniting like wounds in the soft tissues, almost by the first intention. It is seldom, however, that a fracture is so perfectly coaptated as not to require the assistance of this provisional callus, as the numerons specimens in the museums of our medical colleges will abundantly testify.

Treatment.—The leading indications in the treatment of fracture are to procure reunion and to prevent deformity. This is to be effected by placing the fragments in their natural position and maintaining them in perfect contact, and at complete rest until they shall have firmly united. The first thing required, however, says a distinguished author, "is to carry the patient to his house or to an hospital, gently and on a litter, with both legs tied securely together at the knee and ankle, if it be a fracture of the lower extremity, so that there may be no chance of the broken bone being thrust through the skin." A litter may be made of a couple of poles, covered over with a sack, or the patient may be

placed upon a narrow door, or long shutter, or two pieces of board, or he may be conveyed in a spring furniture car, or whatever other mode that may be considered expedient.

Various *fracture beds* have been invented by surgeons, amongst the most ingenious of which may be classed those of Burgh, Coates, Daniels and Hewson, but for all practical purposes I believe that the simple hair or moss mattrass, tufted firmly and laid upon a board bottom to afford an even surface and secure firmness to the whole arrangement, and a bed pan to receive the fecal evacuations is all that need be desired under ordinary circumstances. If long confinement be anticipated or if the patient has been worn out by previous disease, an air mattress may be substituted in order to prevent bed-sores.

The bed upon which the patient is to lie should be made as firm and *level as possible*. A comfortable bed, says Gross, "is to a man with a broken thigh or leg an indispensable article, and the practitioner who fails to give the proper instructions respecting it, is guilty of a gross dereliction of duty." After arranging the patient comfortably in bed, he should be undressed, thoroughly examined and washed from head to foot and dried with a coarse towel. The limb should now be placed in a position of muscular relaxation, and attention given to the setting of the bone. To accomplish this, the upper end of the limb must be held steadily by an assistant, while the lower is extended, or firmly and gently drawn in such a direction as to restore the limb to its proper length and shape; the surgeon in the meantime adapting the fragments to their correct position, by manipulation with his fingers. To prevent pain and spasm, chloroform or other anæsthetic should be administered during the setting of the fractured bone. The limb should be carefully bandaged from its extremity to a considerable distance above the point of injury, for the purpose of preventing swelling, and confining the muscles that they may not contract and disturb the healing process.

Apparatus.—After adjusting the fractured limb, it is necessary to employ some mechanical contrivances to preserve the limb in its natural length and shape and prevent motion at the fractured part. The means employed for this purpose are ***splints***, ***cushions***, ***bandages*** and ***adhesive strips***.

Splints are made of various materials, as wood, trunk-board, leather, felt, gutta percha, tin and iron, either being selected in accordance with the fancy, caprice or personal experience of the practitioner. In fracture of the thigh and leg, especially in that form which requires permanent extension and counter-extension, splints of wood adapted to the size and shape of the limb, have been found of most service. In fracture of the upper extremity, splints made of binder's or trunk-board, dipped in hot water and moulded to the form of the limb, answers an excellent purpose. Prof. Gross recommends "*unoiled* leather and felt, the latter being rendered stiff by gumshellac, which make excellent splints and which I have often used with much satisfaction in fractures both of the upper and lower extremities." Previous to their application, they should be softened in hot water, all angularities cut off, and then be moulded and adapted to the injured limb.

The *gutta percha* splints are extensively used, on account of their lightness, neatness, and the ease with which they are applied. When cut to the proper size, and dipped into hot water, they may be easily moulded to the form of the part for which they are intended, which, upon cooling, they always retain. Like other splints, they should be well lined with wadding or linen, to prevent irritation of the skin.

Dr. W. B. James, of Philadelphia, has devised an ingenious splint for fractures of the upper extremity, which, from its simplicity, durability and adaptability to the parts interested in such fractures, is deserving of attention. The material of the splint is vulcanite, and is thus described by the author: "It is hard, like a piece of board, but, by holding it over a lighted candle, or by subjecting it to the heat of a bright fire, you can heat it up so that it will bend in any direction. By plunging it into cold water, it is set immediately. There is no trouble in moulding it so as to fit any part of the body. You can give it the proper curves almost immediately, after a little experience. Take two splints prepared and adapted to the limb and make a series of holes along the corresponding edges of each, so that that they can be laced up like a shoe, which may be tightened or loosened, according to the exigencies of the case. Along the other corres-

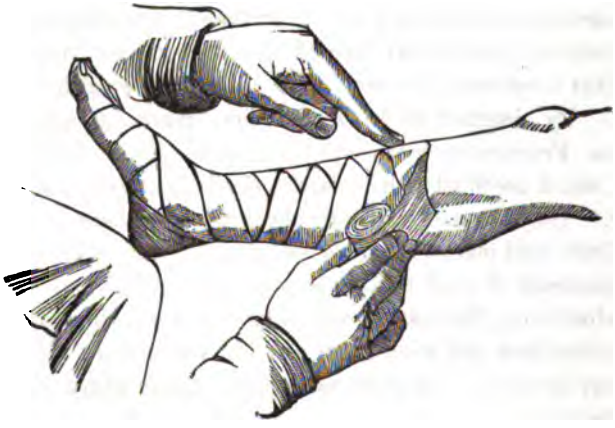
ponding edges make a row of double loops. In applying it, attach a long string or lace to one end of the row of loops and run it through the double series of loops, having taken the precaution of interposing between the limb and splint some such material as gun cotton, or other soft substance, to preserve uniform pressure and prevent abrasion of the skin." It does not interfere with ventilation to the arm; can be tightened or loosened in a moment; is light, and in other respects well adapted to both simple and compound fractures.

The material of which the splint is composed is of less consequence than the mode of its application. Two points require our particular attention, viz: That the splint is sufficiently broad to extend to the external line of the limb and not press upon it, and that it embrace the two joints connected with the fractured bone. By inattention to these rules, much deformity often results. Fracture cushions are usually made in the form of small bags, which are filled with *bran*, *chaff*, *cotton*, *straw*, *tow* or *horse hair*. They are used to fill up the inequalities between the splint and limb, and must vary in shape and thickness, according to the requirements of each particular case. Instead of cushions, pads are often used, the best of which are made of old blankets, cut into strips long and wide enough to line the splints, and sufficient number should be laid on so as to press exactly where the surgeon desires it.

Dr. Gross, in his treatise on the Diseases of the Bones and Joints, published in 1830, first called the attention of the profession to the use of the adhesive strips, which are now much employed in the treatment of fractures as retentive means; or for the purpose of maintaining extension and counter-extension. Dr. John Swinburn treats fractures of the long bones almost exclusively with the aid of these strips, dispensing with the roller and often even with splints. The fracture bandage or roller is an agent of good or evil, according to its use, and should be cautiously employed in the early stage of fracture; should be always used in the second dressing when preparing the limb for the starch bandage. When employed, it should consist of coarse linen or muslin, and never be made of new cloth, but of cloth that has been washed to rid it of its starch. The bandage most com-

monly used is the ordinary single-headed roller, of a length and breadth suitable to the affected limb to which it is to be applied. The object of the bandage is two-fold; to afford uniform compression of the limb, and the better to prevent swelling and spasm. In its application, the rule is to begin at the remote part of the limb, and proceed upwards to some distance above the seat of the fracture, care being taken to apply it sufficiently tight to fulfill the object for which it is designed, as is shown in Fig. 294, when applied to the leg.

Fig. 294.



Everything being in readiness, the next duty of the surgeon is to reduce the fracture and bring the fragments to their natural position. This should always be accomplished as soon after the accident as possible, as at that time the muscles will offer less resistance. The reduction may be accomplished by manipulation, pressure and counter-pressure; or by extension and counter-extension, according to the part injured. The former often being all that will be required in fractures of the upper extremity, jaw and nose, while the latter will be for all fractures of the thigh and leg, and at times for the arm and forearm. The extension is usually made upon that portion of the limb which is articulated with the lower fragment, and the counter-extension upon that whith is articulated with the upper. When the fracture occurs in a child or feeble person, where but little muscular resistance is present, the

extension and counter-extension may be applied directly to the two fragments of the bone.

Extension should always be made slowly, and gradually, as in that manner we may the better overcome the spasmodic action of the muscle. The degree of force will vary according to the character of the displacement, but it should always be sufficient to remove the shortening of the limb and overcome every obstacle which opposes the reduction. The reduction having been accomplished, the fragments are presssed into their natural position, and retained there by the application of splints and bandages. If the fracture occupies the superior extremity, a sling should be used to support the forearm and hand, after which the patient is able to walk about, recline, or sit as he may prefer. But if the fracture occupy the thigh or leg, it will be necessary for the patient to remain in bed until the fragments have become united, or, until the swelling and inflammation has so far subsided as to admit of the application of the starch bandage to be applied as directed. During this time, the limb should be placed in such a position, as to relax and rest the muscles which pass over the fracture, extension and counter-extension being at the same time kept up by the use of proper appliances.

After-treatment.—The fracture having been reduced and the limb properly dressed, the patient should still be carefully watched. The diet for the first few days should be light and nutritious. If fever should arise it will be easily controlled by the administration of *Aconite*. If there is much pain and swelling in the limb, it may become necessary to remove the dressings at the end of twenty-four hours, and apply them more loosely, but this should be prevented if possible, as by too frequent changing of the dressings the ends of the injured bones are liable to become misplaced, and the reparative process impeded. The injured limb should be well protected from the weight and irritation of the bed coverings, by the use of a tripod placed over the limb to sustain the weight of the bed clothes. As a precautionary measure, the fingers or toes of the fractured limb should be exposed that the surgeon may be enabled to judge of its condition. If they appear unduly congested and swollen, the dressings should be removed at once and reapplied with great care to prevent

supervention of gangrene; once in two or three days, if everything goes on favorably, is often enough to renew the dressings for the first week or two, and after that time once or twice a week will fulfill all indications of treatment so far as the dressings is concerned. While in no class of cases is meddlesome surgery to be more reprobated than in fractures, yet patients suffering from these infirmities require constant and careful watching by the surgical attendant, his visits being at least once a day until after the subsidence of all inflammatory symptoms.

As a means of preventing weakness and stiffness of the limb passive motion should be instituted as soon as the fragments have become sufficiently united to preclude the possibility of interrupting the consolidating process; under ordinary circumstances this will be about the third or fourth week after the accident. During its performance the limb should always be well supported by assistants and motion made with moderation and gentleness, increasing gradually from day to day.

Special Apparatus.—In addition to the apparatus already described for the treatment of fractures, much benefit may be derived from the use of a bandage previously moistened by some mucilaginous solution, which upon drying forms an unmovable case for the limb. This mode of treatment was first announced by Dr. Seutin, of Brussels, in 1834, and has been since adopted by the profession at large. Surgeons do not agree upon the substance to be used for moistening the bandage, but so long as the object is gained, it matters little what substance is employed. Cooper, an English surgeon, employed bandages saturated with a mixture of the albuminous part of eggs, and wheat flour. Lawrence, powdered chalk instead of the flour. Velpeau used dextrin. Smee, gum arabic and whiting. Gum shellac, glue, and plaster of Paris have also been highly recommended. Seutin was the first to recommend the use of starch, which is the substance generally employed by surgeons in this country. The advantages of this bandage are that it takes the shape of the limb accurately and maintains the fragments in their place by its solidity; it is light, inexpensive, and easily applied. In fractures of the lower extremity, it permits the patient to remain up, and move about with the aid of crutches, during nearly the whole treatment, thus

preventing the injurious consequences which often arise from close confinement. This bandage should never be applied until the subsidence of inflammation and swelling. In applying the bandage I usually follow the mode adopted by the University College Hospital which is as follows: The whole limb is enveloped in a layer of cotton-batting laid along the limb and over the jutting prominences, firmly and evenly; over this should be laid splints of felt or pasteboard, properly shaped to fit the limb, and extending beyond and securing the two joints above and below the fracture, and well soaked in thin starch before application. The pasteboard, felt, or other substance, should be soft and carefully applied. If but little strength is required, as on children, a few slips of brown paper well starched may be used instead of pasteboard. A bandage saturated with thick starch must now be firmly applied, and this in time covered by another dry roller. Extension and counter-extension must be kept up until the bandage is thoroughly dry, which seldom happens before thirty or forty hours. When the bandages have become dry, the patient may be allowed to move about upon crutches, care being taken that the injured limb does not touch the ground. If the bandage gives discomfort, or becomes loosened by a shrinking of the limb it must be slit up along the outer side of the limb by means of Seutin's scissors and reapplied with the aid of a roller as before. If the fracture be compound, a trap may be cut in the bandage opposite the seat of injury through which the wound may be dressed.

After-treatment.—The leading indications in the treatment of fractures are to procure reunion and to prevent deformity. The fracture having been reduced and the dressings applied, the patient should be carefully watched in order that he may be safely conducted through his long and wearisome confinement. His diet for the first few days should be light and unirritating, and attention should be given to the alvine discharges, as lying in bed for any length of time is apt to produce torpor of the bowels, and consequent irritation of the system which is often productive of febrile reaction. If fever supervene it may be removed by a few doses of *Aconite*, which must be increased in frequency as the symptoms become more urgent. After subsidence of the fever,

the patient will return to his accustomed diet, the attendant being careful to impose upon him moderation for a few days. If there should be retention of urine from any cause, it may generally be overcome by a few doses of *Cantharides*, but in the event of the bladder not being relieved by this agent, the catheter should be employed from time to time until the bladder returns to its accustomed functions. During this time the patient should be seen by the surgeon once or twice a day and even oftener if the circumstances of the case demand it. During the urinary trouble the patient should drink sparingly of water, to check, so to speak, the hyper-secretion of the kidneys. The great danger, says Gross, "in nearly all cases, so far as the safety of the limb is concerned, is during the first week; that past, there is seldom any risk. As soon as all inflammatory action has subsided, which must be treated according to the indications already laid down in the article on Inflammation, vol. 1, page 194, *Symphytum officinale* is capable of accomplishing the most beneficial results in assisting the reparative process and the proliferation of cells and the rapid formation of the constructive callus. In a number of fractures treated both in civil and hospital practice I have seen the most wonderful effects follow the use of this remedy, and so great is my confidence in its curative action in uniting fragments of bone, that I should feel that I was neglecting the best interests of my patient by withholding the use of this remedy. In every case in which I have employed this agent, union has been effected promptly, all the outward conditions in each instance being materially benefitted as soon as the system became influenced by the medicine. Dr. Jahr, in his "Forty years' Practice," illustrates in a striking manner the complete triumph of this remedy in the following case: "A boy of sixteen years, belonging to a very respectable family, had fractured the humerus close to the shoulder joint. The bone was set by a young surgeon of excellent reputation for skill, and connected with the medical school of Paris in the capacity of private teacher of surgery. In answer to the father's question, what he thought of the propriety of resorting to homœopathic treatment during his attendance on the boy, he stated that his business was to attend to the surgical part of the treatment. Before the bandages were applied, the necessary compresses were

moistened with the tincture of *Symphytum* and three globules of the 30th attenuation were at the same time administered internally in form of a watery solution, of which the patient took a teaspoonful three times a day the first three days, and afterwards only a teaspoonful morning and night. The surgeon promised to return in a fortnight, during which time the *Symphytum* was only continued internally. On his return and after removing the bandage and examining the arm, he exclaimed in a state of amazement: 'If I had not examined the arm before, and had seen the fracture, I should not believe that the bone had ever been broken. I have never seen a bone unite so rapidly; if I apply another bandage, it is simply for the sake of safety. Let me have your vial of *Symphytum*; I will use this medicine in my own cases and if I perform a few more cures like this, I shall turn homœopath and instead of practicing medicine, devote myself exclusively to surgery.' This gentleman is now professor and a celebrated operator, but he has kept his word—attending exclusively to operations, he treats his cases homœpathically without saying anything about it, owing to his position in the faculty; but he favors the homœopaths in every possible manner, so that it is a real pleasure for us to consult with him."

This one incident speaks volumes of praise for homœopathic therapeutics and proves that the illiberality and bigotry in allopathic medicine is slowly yielding to the superior efficacy of our remedies in every instance where they are properly and fairly put to the test of experiment.

If the patient be of a scrofulous constitution *Iodine* or *Calcarea* may be given as a constitutional remedy, say a single dose of the higher potencies at night, while the *Symphytum* is administered during the day as often as may be demanded by circumstances. If the periosteum has been injured during the violence which caused the fracture, *Ruta* and *Mezereum* are remedies of value and may be given internally or applied locally as demanded. Threatened gangrene may be promptly cured by *Lachesis*, if the injured part assumes a dark violet-red color, and *China* or *Arsenicum*, if it has become blackened in appearance. Other remedies may be required according to the various diseased conditions that may arise during the conduct of the case which must be met and combatted by the appropriate similimum.

COMPOUND FRACTURE.

Definition.—A compound fracture is that form of injury which is complicated with a wound of the soft parts leading down to the bone at the seat of fracture. 1st. It may be caused by the same injury that produced the fracture. 2d. From a fragment of the broken bone being thrust through the skin. 3d. By subsequent ulceration or sloughing of the integuments.

Dangers.—The danger from compound fractures depend to a certain extent on the amount of injury sustained. This at times may be so great as to lead to the immediate supervention of gangrene, to the loss of life by hemorrhage, or to disorganization of the limb from reactionary inflammation. The more remote dangers arise from abscess, or the exfoliation of the bone, or by the secondary diseases that may arise, such as erysipelas, pyemia, hectic, phlebitis, or congestion of the lungs, any of which may lead to loss of the limb or life. In all serious cases of compound fracture, the first question to be decided by the surgeon is whether the limb should be removed or an attempt made to save it. If the bone has been much shattered, the soft parts bruised and the cellular tissue torn up and infiltrated with blood; if any of the large joints be implicated with extensive injury of the soft parts; if one or more of the larger vessels of the limb have been extensively injured; if the patient be old or enfeebled, or if the collapse be excessive, then amputation should be immediately performed as being the only means by which the patient's life may be saved. If, however, the fracture be unattended by any of the complications just mentioned, and the patient be young and healthy, we shall generally succeed in saving the limb.

Treatment.—Having determined to save the limb, the first step to be accomplished is the reduction of the fracture which is to be conducted on the same principle as in simple fracture; any loose fragments of bone should be removed and the wound closed and dressed with lint saturated with *Calendula* or *Hypericum* lotion with the hope of obtaining union by adhesion. If hemorrhage takes place from any small vessels in the neighborhood that have been injured by the violence committed, compresses wetted with the tincture of *Gossypium herb*, will be found beneficial not only in suppressing hemorrhage, but in healing the cut or lacerated

ends of the injured vessels. Indeed, I have found this remedy to act promptly in controlling hemorrhage from all lacerated or incised wounds, and in one case to staunch the current of blood from laceration of the superficial palmar arch without resorting to any other expedient. This was accomplished by the use of the prepared *Gossypium* now being sold by the various pharmacies throughout the United States, and which I believe to be an agent of great value for the suppression of almost every form of hemorrhage. The limb should then be placed in well-padded splints protected in the vicinity of the wound by oil silk to prevent soiling of the clothes by the discharges. If there be much bruising of the soft parts about the wound, it will be best from the first to apply *Arnica* or *Hypericum* water-dressings, in order to moderate the inflammatory action and allow a vent for the discharges which will certainly ensue. The patient should be kept as quiet as possible. After suppuration has set in, *Silicea* should be given internally, light poultices wet with *Calendula* or a lotion of the same, applied to the wound, and the burrowing of matter prevented by the application of compresses, or by the use of counter-openings when necessary, and by attention to the position of the limb. The parts should be kept perfectly clean, and the dressings changed as often as they become soiled. Should the patient seem disposed to sink under the influence of close confinement and the exhausting discharges, the most nutritious food and drink should be freely administered and the proper remedies administered to meet the exigencies of the case. As soon as the bone has become somewhat united, the limb should be put into a starch bandage to enable the patient to keep up his general health by a change of air and position. The time required for the consolidation of compound fractures will necessarily be much longer than that of simple fracture and will vary according to the amount of injury done to the soft parts and the constitution of the patient.

If the compound fracture is accompanied with laceration of a large artery, the bleeding vessel must be tied in the wound, or the hemorrhage be controlled by position or pressure, if it does not yield to the remedies above mentioned. *Great comminution of bones*, and *fractures into large joints*, especially in the lower extremity, will sometimes demand immediate amputation.

As strongly as I would advocate conservatism in surgery, I cannot but feel that immediate amputation will promote the best interests of the patient in most cases of compound fracture of the knee joint. A compound fracture with a simple fracture in the cardiac side of the same limb, the soft parts lying between these fractures being more or less injured, demands amputation if performed at all above the seat of the simple fracture. In fracture with dislocation higher up, after temporary reduction of the fracture the dislocation should be first reduced, the fracture being subsequently treated on its own merits.

NON-UNION AND FALSE JOINT

May arise from many causes; sometimes inherent in the part or system, as in the neck of the thigh bone, olecranon and patella, which are not invested with synovial membrane; sometimes on account of want of attention on the part of the surgeon, or by some misconduct on the part of the patient himself. One of the most common causes of this accident is motion or movement of the fragments before they have become ossified. In cases of this kind, the effused lymph will be converted into fibrous bands, which will unite the broken fragments, or the ends of the bones will become covered by synovial membrane and union thus be prevented. Non-apposition of the bones is another fruitful source of this malady. Deprivation of nervous influence, debility from any cause, pregnancy, lactation, the inordinate use of spiritous liquors, a syphilitic, gouty or rheumatic state of the system, may all exert their influence in retarding the reparative process.

Treatment.—The first indication is to find the cause of the imperfect union, if possible, and to combat it with appropriate measures. Debility must be counteracted by nutritive food and stimulants. A gouty, rheumatic or syphilitic state of the constitution must be overcome by the proper remedies. If it depends on too much motion of the fragments, the ends of the bones should be brought into perfect apposition, and confined by the use of the starch bandage or plaster of Paris mould. Should this fail, means must be taken to excite adhesive inflammation at the seat of the fracture. This may be done by rubbing the ends of the

bones roughly against each other, by the introduction of a seton between the broken fragments, by scarifying the ends of the bone by means of a knife introduced subcutaneously, or by Bigelow's *subperiostial resection* of the ends of the bone, holding them in apposition with a wire suture.

Dr. Brainard, of Chicago, suggests that the fragments of bone be drilled subcutaneously with a metallic perforator in the following manner: "In case of an oblique fracture, or one with overlapping, the skin is perforated with the instrument at such a point as to enable it to be carried through the ends of the fragments, to wound their surfaces and to transfix whatever tissue that may be placed between them. After having transfixed them in one direction, it is withdrawn from the bone, but not from the skin, its direction changed and another perforation is made, and this operation is to be repeated as often as may be desired." Professor Gaillard's method consists of pinning together the fragments by means of a gimlet-like instrument, provided with a movable silver sheath, a handle and a brass nut; the sheath is introduced through an incision, and held against the bone while the shaft is passed through and made to transfix both fragments; the nut is then screwed down firmly on the sheath, the whole instrument being allowed to remain in situ till union is obtained. Whichever method is adopted the after-treatment must be carefully conducted; *Symphytum* is to be administered externally and internally and the case treated according to circumstances. I have never heard of and certainly have never experienced in the various cases of fracture I have treated, both in hospital and civil practice, this mal-condition where the *Symphytum* was properly administered, and I do believe that non-union of bones, except under the most adverse circumstances, will never occur under the judicious use of this remedy. Professor Morgan, of Philadelphia, reports a number of cases of delayed union in bones to have been speedily corrected by *Calcarea phos.* from the third to the sixth potency.

As a last resort excision of the ends of the bone may be performed. This operation is not without danger and should never be performed until after the failure of the more simple means. There are cases in which all these means will fail of accomplishing

the desired object and the limb remain useless. The only resource in such cases being the use of Professor Smith's apparatus or some other suitable contrivance.

CHAPTER II.

FRACTURES OF THE BONES OF THE FACE.

SECTION I.

FRACTURES OF THE NASAL BONES.

Fractures of one or both of the nasal bones occur as a result of external violence, applied directly to the part, and are usually attended by injury and swelling of the soft tissues. Not infrequently, also, the accident is complicated with fracture of the ascending process of the superior maxilla, and more rarely with displacement of the nasal cartilages, or fracture of the ethmoid, vomer or turbinated bone.

Symptoms.—The deformity arising from displacement of the fragments presents a very marked feature of the accident, which together with the ecchymoses and swelling, and the presence of crepitation generally renders the nature of the case apparent. Owing, however, to the rapidity with which swelling ensues, the diagnosis is sometimes very obscure; hence in no case should the surgeon be satisfied with a hasty examination, notwithstanding the tenderness of the parts, as the slightest deviation from a perfect adjustment is followed by a very noticable and unpleasant deformity.

The situation of the fragments is to be ascertained by passing the finger over the surface of the nose, while at the same time the irregularity and mobility of the parts may be more clearly

shown by introducing a probe into the nostril with which to make counter-pressure.

Prognosis.—Fractures of the nasal bones are particularly liable to be followed by deformity of a more or less marked character, while other serious consequences, such as erysipelas, copious effusion of blood, or severe concussion from injury to the ethmoid bone may exert a marked influence in the case. Hence, the operator should be especially guarded in his prognosis.

Treatment.—The first indication in the treatment is the replacement of the fragments. To accomplish this, the patient should be seated upon a chair with his head thrown somewhat backward and resting against the breast of the surgeon or of an assistant, in which latter case the operator is to stand in front of the patient. A pair of ordinary dressing forceps, a female catheter, or if there be much swelling a small stiff probe or director, may be employed in elevating the depressed portions of bone, by passing it into the upper part of the nostril and pressing outwards, at the same time facilitating the restoration by external manipulation with the fingers of the other hand. If the septum be broken it may be restored to position in the same way, the shape of the nose being preserved by plugging the nares if necessary. Ordinarily little or no difficulty is experienced in effecting the reduction, simple pressure with the finger being quite sufficient. In most cases no retentive apparatus is required, except the application of an adhesive strip carried across the arch of the nose from one cheek to the other. Provided, however, it be desirable to apply medicated dressings, or to make pressure upon a prominent fragment, a double-T bandage, as represented in figure 295, may be applied. The introduction into the nostril of a metallic or gutta percha tube, has been recommended as a suitable means of

Fig. 295.

preventing an inward redisplacement of the bones, while the older surgeons advised the use of pledgets of lint. Such contrivances, however, as already intimated, are not required in the great majority of cases coming under the observation of the surgeon, and in consequence of the irritation likely to follow their use, no application of them is to be made, unless the bones have been so extensively crushed as not to admit of retention by any other manner.

The inflammatory and cerebral symptoms are to be treated upon general principles according to the peculiar circumstances of the case, care being taken to guard against the occurrence of erysipelas, especially if the integuments are broken. Hemorrhage may be restrained by the use of *Gossypium* or *Erigeron* lotions, *Bisulphate of iron*, ice water, &c., or if obstinate, by plugging of the nostrils.

Fracture of the Lachrymal bones may be produced by violence, and is liable to cause obstruction of the nasal duct, and consequent epiphora; or emphysema of the subcutaneous tissue may succeed each effort of blowing the nose.

Treatment is the restoration of the parts by manipulation and the use of medicated dressings of *Arnica* or *Hypericum*, and the retention by appropriate bandages.

Fracture of the Zygoma may take place as the result of an injury, and if simple, little else is required than cold medicated lotions to restrain swelling and pain, which should be kept in place by retentive dressings. If the bone is communited, the impaction of the splinters in the temporal muscles may interfere with mastication; in such a case the surgeon will be justified in cutting down upon the parts and remove the offending fragments. The wound thus made will be dressed as an incised wound.

§ 2.—FRACTURE OF THE SUPERIOR MAXILLARY BONE.

This injury is commonly the result of great mechanical violence, and presents an extensive variety as regards its form, situation and complications. Thus, the bone may be broken through its body, the nasal or the alveolar processes, or the horizontal plate may be the seat of fracture. The soft parts are always injured to a greater or less extent, while the accident is liable to

be seriously complicated with fractures of neighboring bones. The diagnosis is generally rendered easy by simple inspection or by manipulation. The inflammatory action is apt to run high, though commonly a favorable prognosis can be given.

Treatment.—Provided, the injury is not complicated to any extent, restoration of the parts to their normal position with the subsequent application of a retentive apparatus, is all that will be required. In more severe cases, it will be necessary to keep the patient at rest, carefully watching the occurrence of the local and constitutional symptoms and dressing them with appropriate remedies. In all cases, unless the fragments be completely separated, efforts should be made to save all the tissues without removing any portion, however much injured. If the teeth have been knocked backwards, thus injuring the alveolar processes, they should be pressed into position and retained, if necessary, by tying the teeth with silver wire in the shape of a figure-of-8 suture. The patient should not be permitted to chew hard food for several weeks, or, in view of the severity of the case, it may not be advisable to use the jaw in masticating solid food for months. If the fracture is *compound*, any *loose* splinters should be carefully removed together with all foreign matters in the wound, and coaptation of the divided surfaces effected by means of adhesive strips, followed with a lotion of *Hypericum* or *Calendula* continually applied to the part and retained by suitable dressings. If hemorrhage succeed, a free use of *Gossypium* lotion will usually restrain it. The vascular supply in this part is so free, that necrosis rarely follows, even in cases of gunshot injury. The fetid discharge is, however, not only a source of annoyance, but of constitutional irritation, which should be obviated by disinfectant lotions continually applied to the part and thrown into the mouth occasionally as may be required.

§ 3.—FRACTURE OF THE MALAR BONE.

Fracture of the malar bone is an exceedingly rare accident, as an independent injury, so much so that its existence has been denied by good authorities. It may result from direct violence and is necessarily attended by severe contusion, thus having a tendency to excite violent inflammatory action.

Treatment.—Efforts should immediately be made to restore the displaced part to its natural situation, which will be best accomplished, if at all, by inserting a lever under the depressed portion of bone. In case the external wound does not admit of this procedure, I should not hesitate to make a convenient opening through the superincumbent structures for this purpose, especially if the deformity be so great as to occasion an unsightly appearance. The cure will be completed by the use of *Arnica* or *Hypericum* lotions.

§ 4.—FRACTURE OF THE INFERIOR MAXILLA.

Fractures of the lower jaw are of more frequent occurrence than those of the upper and may occur in any portion of the bone. The most common site of fracture, however, is near the symphysis between the lateral incisors or between these and the canine teeth. The ascending ramus is also frequently broken, while the condyle, neck and coronoid process are very seldom affected. Fracture through the symphysis when occurring, is met with in young subjects before the opposite portions of the bone are completely ossified. As regards the varieties of the fracture, it may be *transverse*, *oblique*, or *longitudinal;* simple, multiple or complicated.

The cause of the fracture is commonly direct violence, by a blow, fall or kick. Portions of the alveolar process are also frequently broken off by dentists in extracting teeth, while a few cases are recorded in which muscular action has been the means of producing fracture of this bone.

Symptoms.—The symptoms are commonly so well marked that no difficulty is experienced in determining a correct diagnosis. Thus, displacement, mobility and crepitus are quite perceptible, the *deformity* being readily observed by opening the mouth, when the level of the jaw will be found to be destroyed, and the normal relations of the teeth disturbed. The nature of the displacement in any particular case will be well understood by a close reference to the anatomical relations of the muscular attachments of the bone. The principal muscles acting from above to distort the fragments are the masseter, and the temporalis, while the digastric, the genio-hyoid, the mylo-hyoid and

the stylo-hyoid act as direct depressors of the bone; hence the fragments occasioned by fracture at any point anterior to the angle of the jaw, are readily drawn from their natural position by the antagonistic action of the elevator and depressor muscles. Provided the jaw be broken on both sides, the deformity will be very considerable, the central fragment being drawn downwards, thus destroying the natural curve of the teeth, and producing a corresponding distortion of the mouth, which will be open to a greater or less extent.

Mobility of the fragments, which is commonly slight compared with the degree of motion developed in fracture of the long bones, can be detected by fixing the anterior portion of the jaw and making pressure upon the posterior fragment, when crepitation will also be produced.

In fracture of the ramus of the jaw, the existence of crepitus affords the principal sign of the accident, as the mobility and displacement are hardly noticeable, in consequence of the extensive attachment of the masseter muscle, which extends over a portion of both fragments.

In addition to the above symptoms there will be more or less severe pain at the seat of injury, which is more constant than in most other fractures. There is, also, loss of function, rendering the patient unable to speak, swallow, or masticate with facility, while considerable contusion, with hemorrhage is likely to co-exist.

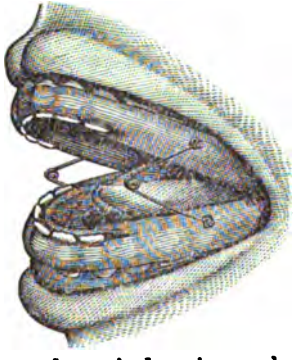
Treatment.—In reduction of this bone, the patient should be seated upon a chair, his head being firmly supported upon the breast of an assistant. The surgeon then moulds the part into proper shape, and closes the mouth so that the lower teeth rest firmly against the upper. If any of the sound teeth are loosened, or partially drawn from their sockets, they should be retained, and secured if need be to the adjacent ones, by a strong ligature or silver wire. After reducing the fracture, apply a piece of pasteboard or gutta percha, softened in boiling water, so that it shall fit the jaw accurately, and cover over all with either Gibson's or Barton's bandage of the jaw, as shown in Figs. 296 and 297. If any of the teeth are broken, and the adaptation imperfect, a thin wedge-shaped piece of cork should be inserted between the molar teeth of each side, in order to keep t

Fig. 296.

Fig. 297.

incisor teeth a little apart. If by chance a tooth shall have been broken and fall into the sulcus between the broken parts, it should be taken out before attempts are made to coaptate the broken fragments. The interdental splints of gutta percha, invented by Dr. Gunning, of New York, and their recent improvement by Surgeon Wales, U. S. N., fulfill all indications necessary in the treatment of this fracture. The two dental splints are made of vulcanized rubber, so as to conform accurately to the shape of the teeth in both jaws, and are made in the following manner: Take an impression of the lower jaw by filling the plate with plaster and placing it in position upon the teeth, while both hands of the operator are placed beneath the jaw, holding the fragments into position until the plaster becomes sufficiently firm to preserve the cast. From the casts the gutta percha splints are moulded, and subsequently vulcanized. The plates should be made light and delicate. They are retained in position by triangular spiral springs, shown in Fig. 298, which force the fragments of bone in position, and retain the plates between the jaws as shown in the figure. The tendency of the jaws to be separated, must be overcome by a sling bandage, passing beneath the jaw and fastened to the top of the head. This bandage should not

Fig. 298.



be so tight as to prevent talking or expectoration, or the taking of proper nourishment.

In fracture of the neck or condyle of the jaw, it is much more difficult to maintain the broken bones in apposition, on account of the action of the external pterygoid muscle. In this variety of fracture, the most effective method of counteracting this disposition, is to confine a thick, graduated compress behind the angle of the bone, the treatment being in other respects, the same as in fracture of the body of the jaw, previously spoken of. In comminuted fracture, it will be exceedingly difficulty to maintain apposition of the fragments, the disposition being to continued displacement. To ensure more perfect union in such cases, it is recommended to unite the teeth together by silver wire making a figure-of-8 suture, and including two of the sound teeth in each fragment; or the interdental plate interposed between the teeth, and all secured firmly, has proved of great value in this variety of injury.

Treatment.—Contusions, wounds, and hemorrhage, complicating these fractures, must be managed according to the principles already laid down. Inflammation should be combatted and all subsequent difficulties cured as they arise, the parts being covered continually with medicated lotions of *Arnica*, *Hypericum*, or *Calendula*, according to circumstances. Care should be taken that displacement be not effected by the loosening of bandages, contraction of muscles, or the effort at mastication. To prevent this, the diet of the patient should consist of broth, gruel, grated crackers and milk for the first two or three weeks, after which a semi-solid farinaceous diet may be permitted.

Simple fractures usually recover in five or six weeks. Those of the neck, require more time and more care in their management than those of the body and ramus. Complicated fractures however, often terminate in serious consequences, such as abscess, caries and necrosis, which must be treated upon the general principles already laid down under their respective headings.

CHAPTER III.

FRACTURES OF THE NECK AND TRUNK.

SECTION I.

FRACTURES OF THE BONES OF THE NECK.

§ 1.—FRACTURE OF THE OS HYOIDES.

Fracture of the hyoid bone is an extremely rare accident. It may, however, be produced by falls, or blows, or by a forcible grasp, as in attempts at choking. It frequently happens, also, in consequence of hanging, the rope pressing firmly against the bone, breaking either one or both of the great cornua, or the body.

The *danger* to be apprehended from the occurrence of this injury, mainly consists in the complications likely to arise. Thus, severe laryngitis, aphonia, abcesses, necrosis, with fistulous openings and other serious consequences resulting from high inflammatory action are likely to supervene, and render the case exceedingly obstinate.

Symptoms.—The patient experiences much difficulty in deglutition, attended by a sense of suffocation, in consequence of the tongue falling back on the epiglottis. Crepitation is generally produced during efforts to swallow, the surgeon, at the same time, having his finger on the detached fragments. A somewhat interesting case is related by Dr. Wood, in which there was severe laceration of the mucous membrane of the fauces, attended by profuse hemorrhage. Crepitation was elicted by swallowing, or by pressing upon the parts with the thumb and finger; the power of speech was materially impaired, while there was high inflammatory action, and considerable swelling of the throat and larynx.*

* N. Y. Journ. Med., vol. xv, p. 152.

Treatment.—Provided there be considerable displacement, efforts are to be made to effect restoration of the parts by introducing the finger into the throat to make counter-pressure, while at the same time, the fragments are to be moulded into position by external manipulation, and the fragments kept at rest by the use of a pasteboard or leather collar. Perfect rest is then to be enjoined, the head being inclined somewhat forwards. As little food and drink as possible should be used for the first few days, and if the inflammatory symptoms continue urgent for a considerable time, or if the patient be unable to swallow, it may be necessary to resort to the use of the stomach tube.

The inflammation is to be combatted on general principles, while all necrosed portions of the bone are to be removed as soon as detached. Union will ordinarily occur in from six weeks to two months.

§ 2.—FRACTURE OF THE VERTEBRAL COLUMN.

In consequence of the peculiar construction of the vertebræ, the manner of their articulation, together with the protection afforded them by the surrounding soft structures, the bones of the spinal column are seldom the seat of fracture. The accident may result from the application of direct violence, as a fall, or blow, and more rarely from "contre-coup," as, for example, when a person falls from a height, alighting upon his feet or hips. Whatever the cause of the injury, however, the fracture may occur through the body of the bone, or through the spinous, oblique or transverse processes.

Symptoms.—The symptoms will vary according to the seat of the injury, and hence, the effects of the lesion are to be considered with reference to the different portions of the spine implicated. The severity of the symptoms, however, will necessarily vary, according to the violence of the cause and the amount of injury sustained by other organs.

In case the fracture occurs above the fourth *cervical* vertebra, the phrenic nerve will be likely to suffer seriously, thus paralyzing the diaphragm, and interfering with respiration, so as to produce death more or less speedily. If, instead, the injury is inflicted at a lower point in the cervical region, there will be more or less

complete paralysis of the upper extremities, impaired respiration, relaxation of the anal sphincters and those of the bladder, together with distension of the abdomen.

If the accident be confined to the *dorsal* region, the upper extremities will suffer little or none, the principal symptoms being exhibited in the lower portions of the body, as the bowels and bladder.

When one of the *lumbar* vertebrae is broken, the nerves supplying the lower extremities become so much affected as generally to occasion paralysis, and perhaps loss of sensibility. The sphincter muscles of the anus are relaxed, the function of the muscles of the bladder being also impaired.

The *diagnosis* of fracture of the vertebræ is almost invariably so obscure as to leave the surgeon in the greatest doubt concerning the precise nature of the injury. The characteristic indications of fracture, as preternatural mobility, crepitation, and deformity, may exist when the spinous processes are the parts affected, but owing to the other portions of the bone being deep-seated, the examination will ordinarily prove unsatisfactory.

The *prognosis* is generally unfavorable. In the more serious cases, in which there is displacement, with paralysis, the patient is not apt to survive more than a few days, though in some cases the result has not been so immediately fatal. A greater or less degree of paralysis, however, will ensue, and be likely to remain permanent.

Treatment.—All efforts to restore the displaced fragments will almost invariably prove unavailing, and if long protracted, will generally result in more harm than benefit. Removing the depressed portion of bone by means of cutting down upon it, as originally suggested by Paulus Ægineta and first practiced by Cline in 1814, and subsequently by others, has not been attended by the success hoped for by the operation. But notwithstanding the unfavorable termination of the cases thus operated upon, I am still disposed to recommend this procedure, where there is evident depression, and the symptoms are so urgent as to preclude a reasonable hope of the patient's recovery without the operation. In this instance the case would in no wise be rendered more serious, while there would be at least a chance of relief.

In less urgent cases little can be done except to place the patient in a comfortable position, generally upon the side, and meeting the inflammatory and other complications that may arise by the remedies corresponding with the group of symptoms presented. It is further to be especially recollected that, under no consideration whatever, should the patient be allowed to lie with his face downwards, as the pressure upon the abdominal viscera would interfere with the free descent of the diaphragm, which, together with the weakened condition of the patient, and the paralyzed state of the respiratory muscles, would tend immediately to produce asphyxia.

The bladder should be carefully watched, and the contents drawn off two or three times per day, which is by far preferable to leaving the catheter permanently in the bladder. *Arnica*, *Cicuta*, *Hypericum*, or such other remedies as are recommended under Concussion, may be employed internally and externally, but under ordinary circumstances little is to be hoped for.

§ 3.—SPINAL CONCUSSION AND MENINGITIS.

Concussion of the spinal cord often exists independent of fracture of the vertebræ, and is produced by causes similar to those inducing a like affection of the brain. If fracture coexist, the symptoms of the concussion are more marked than those indicating the occurrence of the fracture. The most serious cases of concussion are apt to result from falls or blows upon the back, and not unfrequently the severity of the injury sustained by the cord is so great as to occasion speedy death, while the signs of external injury are but slightly marked.

Symptoms.—The body of the patient becomes more or less paralyzed, there is a sensation of sickness at the stomach, involuntary discharges from the bladder and bowels occur, while a prickling, or a sense of numbness is felt along the spine and in the limbs. The patient is also excessively weak and delirious. Should the more urgent symptoms of concussion pass off instead of proving speedily fatal, they are liable to be followed by *spinal meningitis*. This latter affection, developed in consequence of concussion and presenting all the characteristic symptoms of the affection arising from other causes, is undoubtedly more fre-

quently the immediate cause of death, than is generally supposed.

Treatment.—The treatment of this affection is based upon the same general principles recommended under the head of Concussion and Compression of the Brain, to which the reader is referred, vol. 1, page 616.

SECTION II.

FRACTURES OF THE BONES OF THE TRUNK.

§ 1.—FRACTURES OF THE RIBS.

The fourth, fifth, sixth, and seventh ribs are the most frequently fractured, the upper ribs being protected by the clavicle, scapula, and the strong muscles covering them, while the shortness and mobility of the lower ones account for their immunity. The accident as occurring in the ribs most liable to fracture, however, is comparatively uncommon, and is confined chiefly to individuals of advanced age; children and young persons being seldom the subjects of this injury.

The causes operating to produce fracture of the ribs are mechanical violence and muscular action. The former, which is the more frequent, may act directly or indirectly.

The direction of the fracture is generally oblique, and may also be comminuted, multiple and compound. Complications of a serious nature are liable to attend the accident, such for example as wound of the pleura, or of the lung itself, laceration of the neighboring muscles, together with injury of the intercostal artery and nerves. As a consequence of these various complications, pleurisy, pneumonia, congestion or hemorrhage, may supervene, and prove the principal source of danger.

Symptoms.—The characteristic symptoms of fracture, as crepitation, preternatural mobility, and displacement, are not so readily detected in fracture of the ribs as in other long bones, in consequence of which the diagnosis is frequently somewhat obscure.

Crepitation is not easily distinguishable owing to the thickness of the muscular coverings. It may, however, in some instances be elicited by pressing upon the seat of fracture, or by

directing the patient to cough, or take a full inspiration, while the surgeon rests his hand over the point of injury.

An unnatural degree of mobility may also occasionally be discovered during the progress of the examination, especially if more than one rib be broken.

The amount of displacement attending fracture of the ribs is commonly slight unless several of the bones are injured, in which latter case the deformity alone may be quite sufficient to indicate the nature of the accident.

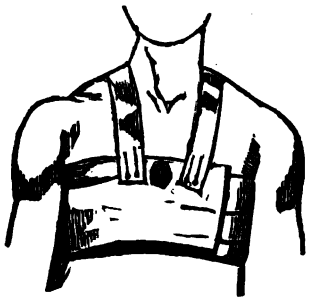
The pain accompanying this injury is generally a symptom of considerable value, taken in connection with other signs. It is usually very acute and, though not limited exclusively to the exact point of the fracture, is greatest there, and always aggravated by efforts to take a full inspiration, or by coughing or sneezing.

Emphysema, when present, is a sign of great value in determining the diagnosis, and is often accompanied by spitting of blood. The emphysematous tumor is sometimes confined to a very limited portion of the surface, while in other cases it may extend over nearly the whole body, but may not be developed until several hours after the accident. Its existence is indicated by a puffy condition of the parts which emit a peculiar, crackling noise upon pressure.

Prognosis.—More or less danger is to be apprehended in all cases of fractures of the ribs, though there exist no very urgent symptoms of any serious complication. Not infrequently the shock to the nervous system, resulting from the severity of the cause, produces unpleasant consequences, while the local and general disturbance may be sufficient to effect a fatal termination. If the fracture is complicated with wound of the lung the case is especially to be regarded as serious; and, indeed, the surgeon should, under all circumstances, be guarded in his prognosis, as high inflammatory action is particularly liable to supervene.

Treatment.—In the milder cases where there is little or no displacement, the chest should be encircled by a bandage, eight or ten inches in width, the same passing several times around the body, and drawn sufficiently firm to prevent the rising of the ribs, thus compelling the patient to breathe by the diaphragm.

Fig. 299.



The bandage is kept from slipping downward by attaching its upper margin behind and in front, to a couple of narrow bands passing over the shoulders. Fig. 299. In preference to the above bandage, some surgeons substitute long strips of adhesive plaster, applied so that each succeeding turn, partially overlaps the preceding one.

The latter form of dressing is somewhat objectionable, in view of the fact that it cannot be so readily adjusted as the former to suit the degree of compression that the patient is capable of withstanding, some persons being able to bear the confinement much better than others. Moreover, the adhesive strips are exceedingly liable to become loosened in the course of a few hours, by the slight, though constant motion of the ribs. In addition to the bandage, a light compress should be placed upon the spine, while the forearm on the affected side should be brought across the chest at a right angle with the humerus, and confined in this situation, in order that the pectoral muscles may be kept entirely at rest. The patient is then to be placed in the position that affords the most comfort, which will usually be found to be either the sitting or slightly reclining posture.

Provided the extremities of the fractured bone project outward the above dressing is to be modified by placing a suitable compress over the seat of injury. If, on the contrary, the fragments are driven inward, little can be done in the line of restoring the bone to its natural position, except to press upon the anterior or posterior part of the chest, with a view to spring the depressed extremity outward. Should this fail, and the symptoms be of a dangerous character, it has been recommended by several surgeons, to cut down upon the fragment and elevate it with a screw elevator or lever. Cases so severe, however, as to indicate treatment of this heroic character, would ordinarily be beyond the reach of successful surgery; still, instances may occur in which such a procedure would be advisable. Instead of this method,

Hamilton suggests the use of forceps, constructed with long and obliquely-set teeth; while Malgaigne has proposed the use of a hook with which to seize the depressed extremity.

The emphysema will rarely demand especial treatment, as it commonly disappears spontaneously. Should it, however, be sufficient to interfere seriously with respiration, the air may be evacuated by the use of a delicate trocar.

Other complications are to be treated upon general principles.

Treatment.—The remedies of most value in the internal treatment of this affection, are, *Acon.*, *Ars.*, *Bell.*, *Carbo veg.*, *Digital.*, *Lach.*, and *Senega*.

Arsen.—when there is great dyspnœa with threatened suffocation, great anxiety and restlessness, face livid and covered with cold perspiration.

Bell.—when the circulation is much disturbed, with dizziness, headache, palpitation of the heart and fullness of the abdomen.

Carbo veg.—when dyspnœa is great, with paroxysmal cough, great anxiety, profuse expectoration; to follow *Arsenicum* when the remedy ceases to have a good effect.

Digital.—complications with heart disease—all the symptoms increased by talking, or drinking anything cold; worse when lying down.

Lachesis—all covering around the neck and chest intolerable, worse after sleeping; is well adapted after *Arsenicum* and *Carbo veg.*

Senega—feeling of constriction in the throat and thorax, with disposition to take deep inspirations to increase capacity of the chest.

External applications of *Arnica*, *Hypericum* or *Symphytum*, are to be applied to meet the corresponding symptoms. In cases of gunshot injury, the after-treatment will be conducted upon the general principles already given under Injuries of the Chest, vol. 2, p. 165.

§ 2.—FRACTURES OF THE STERNUM.

The sternum is rarely fractured, though the bone is liable to give way in any portion of its extent. The accident commonly results from blows or falls, very few cases being reported in which

the injury occurred in consequence of muscular contraction. But whatever the cause, fracture of this bone, from its peculiar structure and situation, implies the exercise of great force.

The dangers arising from the accident, are due rather to the injury inflicted upon the thoracic viscera, than by the fracture itself. Thus, the fragments may be driven inward, producing laceration of the internal organs, with an alarming effusion of blood, or violent inflammation of the lungs may ensue. Abscess of the mediastinum, disease of the bone itself, and emphysema, are each liable also, to terminate unfavorable.

The *diagnosis* of the case is not always readily determined, especially, if there be little or no displacement. Should there be displacement, however, no difficulty will be experienced in ascertaining the nature of the injury, as the co-existence of crepitus, elicited at each respiratory effort, together with the excessive pain, dyspnœa, and spitting of blood, will render the diagnosis clear.

Treatment.—The indications for treatment, independent of the complications likely to arise, are to prevent motion of the parts, by the use of a compress and bandage, at the same time keeping the head and shoulders somewhat thrown backward, which will have a tendency to maintain the fragments in proper position. The bandage may be applied in a manner similar to that recommended for fracture of the ribs; as represented by Fig. 299, page 884.

In case abscess of the anterior mediastinum occur, it has been advised to employ the trephine, or to remove a portion of the bone by Hey's saw. The unfavorable result of the operation as performed by Gibson and others, shows the procedure to be without material benefit, if not a positive injury. Upon this point, Longsdale remarks, that, "the symptoms denoting the presence of the abscess, when completely confined to the under surface of the bone, will be very uncertain; and when the matter collects in large quantities, it will show itself at the margin of the sternum, between the ribs, when it can be let out by making a puncture with the point of a lancet, without the necessity of removing a portion of the bone."

The complications that arise during treatment, other than

those mentioned, must be treated on general principles, and in accordance with the individual peculiarities of each case, while lotions of *Arnica*, *Hypericum* or *Symphytum*, may be freely employed externally, as indicated.

CHAPTER IV.

FRACTURES OF THE UPPER EXTREMITY.

SECTION I.

FRACTURES OF THE CLAVICLE.

In view of the function, exposed situation, and delicacy of structure of the clavicle, it is exceedingly liable to be broken, the variety of the fracture being generally oblique, while it may also be simple, comminuted or compound, partial or complete. The accident may occur in any portion of the bone, partial fracture being more common at the sternal side of its center, while complete fracture is more frequently seated at its acromial extremity, near the inner margins of the trapezius and deltoid. In one hundred and five fractures referred to by Hamilton, including partial and comminuted, and not including gunshot fractures, eighty-eight occurred through the middle third; and with the exception of the partial fractures, the fracture in nearly all of the cases took place near the outer end of this third. The reason of this circumstance is readily explained by reference to the fact that the bone is smallest at this point, and imperfectly supported by muscular and ligamentous attachments.

Causes.—The most common cause of the accident is counter-stroke, as a fall or blow upon the shoulder, in which case, the sternum offering a firm resistance, the force acts upon the shaft of the clavicle with sufficient violence to cause it to give way.

Occasionally it is broken by violence directly applied, as from

a blow or fall, or the kick of an overloaded gun. With force thus applied, the fracture is attended with more or less contusion of the soft parts, and is more likely to be transverse, though the latter form of fracture in this bone is an exceedingly rare occurrence.

Muscular contraction has, also, been known to produce this injury.

Pathology.—Considerable displacement uniformly accompanies fracture of the *middle third* of the clavicle, the outer fragment being drawn downward, forward and inward; downward by the weight of the arm and the action of the deltoid, forward and inward by the pectoralis-minor and subclavius; whereas, the inner fragment is drawn somewhat upward by the sterno-cleido-mastoid, the costo-clavicular ligament and pectoralis-major, however, preventing any very remarkable displacement of the fragment of the bone.

Provided the fracture occur near either the sternal or acromial extremities, the deformity is comparatively slight, the situation and strength of the ligaments being such as to retain the fragments very nearly in apposition.

Symptoms.—The symptoms are generally so well marked as clearly to indicate the true nature of the injury. The shoulder is drawn downward and inward by the weight of the arm and the action of the muscles, while the patient will be found strongly inclining to the injured side, and supporting the elbow of the same side with the opposite hand, in order to take the weight of the limb off from the broken bone, thus, in a measure relieving the pain. The mobility of the arm is materially impaired, it being impossible to effect rotation, or to raise the hand to the face, or, in short, to produce any motions which will cause the external fragment to press upon the cervical nerves. Deformity is readily detected by touch, and often by sight, while crepitation can be elicted by grasping the elbow and causing the head of the humerus to move in a direction contrary to the displacement, or perhaps, by simply pressing upon the more prominent fragment. More or less pain is experienced at the seat of the fracture, as well as in the axilla, while a tingling or numbness, and perhaps, paralysis of the fingers and arm may result.

In partial fracture, the diagnosis is to be determined principally by digital examination, producing, at the same time, as much motion of the fragments as possible, by alternately elevating and depressing the shoulder.

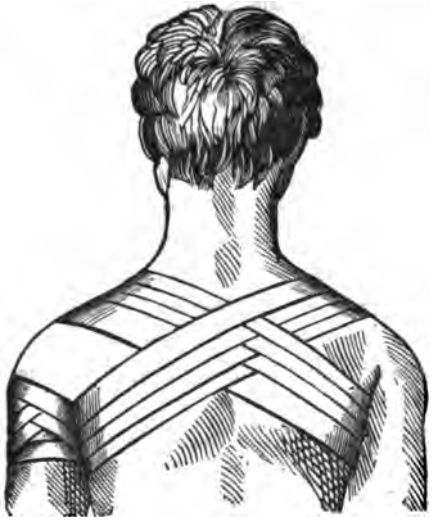
Prognosis.—As regards the restoration of the functions of the arm, the prognosis is generally favorable; while, at the same time, the cases in which reparation occurs without more or less *deformity*, are extremely rare. Hamilton expresses it as his opinion that, "in no other bone, except the femur, does a shortening so uniformly result." Gross writes that, from all the cases that he has seen of this fracture, as treated by other surgeons, and from the numerous specimens of it to be found in our museums, he is satisfied that a cure without deformity is a very uncommon result.

The greatest amount of displacement is found in those fractures occurring through the middle third of the bone, and varies in extent from one-quarter of an inch to an inch; but, notwithstanding the degree of displacement may be even more than this, osseous union is still likely to occur. Provided, however, the union be altogether ligamentous, the chances are favorable to the subsequent usefulness of the arm, as a few recorded cases of this character clearly illustrate.

A cure generally results in the course of five or six weeks in the adult, while in children, the consolidation is much more rapidly effected, the length of time required rarely exceeding twenty days.

Treatment.—In the treatment of fracture of the clavicle the requisites are to carry the arm upwards, outwards and backwards, which, with manipulation along the broken surface, rarely fails to effect approximation of the ends of the fragments. To support the parts in this position, the most common apparatus is the stellated or figure-of-8 bandage, as represented by Fig. 300. In the first place, a thick wedge-shaped pad is placed in the axilla with the large portion upwards; then pass a roller over each shoulder alternately, each turn crossing on the back as represented in the cut. Confine the arm to the side by a few turns of the roller, and then support the whole by a sling. The shoulder is kept outwards by the pad, backwards by the roller, and upwards

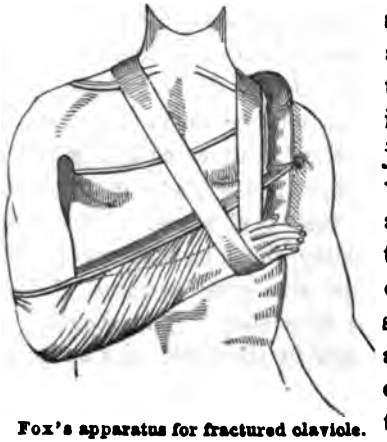
Fig. 800.



by the sling, this fulfilling all the indications desired. The same purposes may be gained by the use of the handkerchief, at least for a temporary expedient, and until other dressings shall be substituted. This is effected by placing one folded handkerchief in the axilla, another is carried over the shoulders as a figure-of-8 bandage, a third acts as a sling, while the fourth confines the arm to the side.

Professor Gross strongly advocates the use of adhesive strips of a sufficient length "to reach around the limb and shoulders, so as to form, in the first place, a kind of immovable sling, and secondly, to secure the arm to the side of the trunk." The strips, he adds, should be from an inch and a half to two inches in width, and so arranged as to make a certain degree of pressure through the medium of a compress, directly upon the seat of the fracture. These dressings need not to be renewed more than twice during treatment of the case.

Fig. 801.



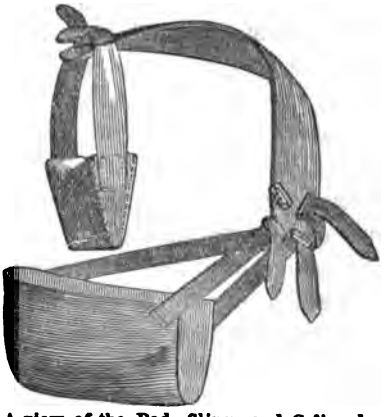
Fox's apparatus for fractured clavicle.

The apparatus of Fox consists of a collar four inches wide, and long enough to go around the shoulder, sewed together on its sides, stuffed with cotton and joined at its ends. The pad is wedge-shaped, to which are attached two tapes to fasten it to the collar. The elbow-piece or sling is not unlike half of the sleeve of a coat, open above, and long enough to embrace the elbow and mount half way up the arm. Two pieces of broad

tape are attached to its upper and lower ends to elevate and hold the arm close to the side, as shown in Fig. 301.

Among the ingenious apparatus devised for the treatment of fractured clavicle, is that of Dr. R. J. Levis, of Philadelphia, which commends itself by "its simplicity, lightness, efficacy and cheapness." It is superior to Fox's apparatus "so long and extensively used in this country" and has almost entirely superseded its use. Levis's apparatus consists of a short, firm, axillary pad supported by two straps, attached to a broad supporting band. From the front of this band, which crosses the upper part of the back and descends on the anterior part of the chest, giving a firm surface of support, is suspended a sling in which the elbow is sustained. On the back of the sling, behind the elbow, is fastened a strap which crosses the back obliquely, and coming in front on the sound side, is buckled to the front end of the supporting band. See Fig. 303. In adjusting the apparatus, the shoulder is supported and the pad immovably held *high* in the axilla, where its pressure can be more conveniently borne than lower down; the wide band is thrown across the shoulders, the elbow placed in the sling, and the long strap attached to the back of the sling carried across the back and finally buckled at its front attachment to the wide supporting band. See Fig. 304. Dr. Levis's apparatus can be made by any one from any strong material such as drilling, webbing or soft leather. The width of the wide band should be from two to four inches and its different pieces held together by buckles, buttons or tapes.

Fig. 303.



A view of the Pad, Sling, and Collar described in the text. (After Levis.)

Dr. Dugas, of Georgia, treats fractured clavicle with a pad and a triangular piece of thick, unbleached muslin, to each angle of which is attached a bandage from three to four yards in length by three inches in width. A full description of this apparatus

Fig. 304.

Levis's apparatus applied.

is published in the Southern Medical and Surgical Journal, for 1852.

The plan of this dressing is to form a sling for the elbow and forearm, a pad for the axilla and at the same time securing the arm firmly to the side.

Professor Sayre, of the Bellevue Hospital, has devised a simple and effective dressing for fractures of the clavicle, which consists of two strips of adhesive plaster three to four inches wide (narrower for children), one piece being long enough to surround the arm and go completely around the body; the other to reach from the sound shoulder around the elbow of the fractured side and back to the place of starting. The first piece is passed around the arm just below the axillary margin and pinned and stitched in the form of a loop sufficiently large to prevent strangulation, leaving a portion on the back of the arm uncased by the plaster. The arm is then drawn downward and *backward* until the clavicular portion of the pectoralis-major is put sufficiently on the stretch to overcome the sterno-mastoid and thus pull the inner portion of the clavicle down to its level. The plaster is then carried smoothly and completely around the body and pinned to itself on the back to prevent slipping. This strip fulfills the two-fold purpose, first, of putting the clavicular portion of the pectoralis-major on the stretch and preventing the clavicle from riding upward; second, by acting as a *fulcrum* at the center of the arm, when the elbow is pressed downward, forward and inward, it necessarily forces the other extremity of the humerus (and with it the shoulder), *upward*, *outward* and *backward*; and it is kept in this position by the second strip, which is applied as follows: Commencing on the front of the shoulder of the sound side, draw it smoothly and diagonally

across the back to the elbow of the fractured side, where a slit is made in its middle to receive the projecting olecranon. The elbow being held by an assistant *well forward* and *inward* is retained there while the strip is continued over the elbow and forearm, pressing the latter close to the chest, and securing the hand near the opposite nipple, crosses the shoulder at the place of beginning, where it is firmly secured by pins. By this process the fractured bones are retained in position and cannot be displaced by any reasonable amount of force, and in the case of children, where it is so difficult to retain the ordinary dressings, this dressing possesses advantages superior to any known method. I have used it in three cases, two of children and one in an adult, who had sustained fractures of this bone and was gratified at the entirely successful results in each case. I feel confident that if once used, no other dressings will be substituted for this exceedingly simple and efficacious method of treating these fractures.

In fracture of both clavicles the difficulty in the treatment is much increased, but the same principle of adjusting apparatus heretofore given will be as appropriate in double as well as single fractures of this bone. The after-treatment will be as in other fractures with free use of *Symphytum* internally and locally applied.

SECTION II.

FRACTURES OF THE SCAPULA.

Fracture of the scapula is an accident of extremely rare occurrence, which circumstance is owing to its mobility, position, and to the protection afforded it by the surrounding muscles.

It is, however, liable to be broken in a variety of forms and directions. Thus, either the acromion or coracoid process may be broken off, while a fracture may also extend through the body or the neck of the bone.

Fracture of the Acromion Process may be produced by, violence applied to the top of the shoulder, or directly to the process itself, while in rare cases it may result in consequence

of a fall upon the elbow or palm of the hand, thus forcing the head of the humerus violently upward.

Though surgeons have regarded this form of accident as frequent, compared with the other varieties of fracture occurring in the scapula, still there is reason to believe that many of the specimens preserved as examples of fracture, are merely a separation of the epiphysis, the ossific union having never been completed. Mr. Fergusson, writes, "I have dissected a number of examples of apparent fracture of the end of this process; but in such instances, it is doubtful if the movable portion had ever been fixed to the rest of the bone." Upon this point, also, Hamilton remarks that, "It is very probable, that in the case of many of the specimens found in the museums, called fractures, the histories of which are unknown, they were united originally by cartilage, and that in the process of boiling, or of maceration, the disjunction has been completed."

The symptoms in ordinary cases are so clearly defined, as to render the diagnosis easy. The shoulder has a peculiarly flattened appearance, the outer fragment being drawn downward by the weight of the arm, the functions of the latter being in a great measure destroyed. This is especially the case, provided the fracture be through the articulation, thus producing dislocation of the clavicle. Pain, more or less intense, is referable to the seat of injury; the patient leans toward the affected side; while crepitation can be detected by forcing the head of the humerus upward, against the depressed fragment; an evident inequality is felt in tracing the spine of the scapula.

Diagnosis.—This accident is liable to be confounded with dislocation of the humerus downward. The distinguishing features, however, are, that in the latter case the arm is not freely movable, while in fracture of the acromion, it can be moved in various directions, and made to press against the fragments so as to restore the natural contour of the shoulder. In dislocation, also, considerable force or manipulation is required to effect the reduction, after which displacement is not likely to recur, the opposite of what is observed in fracture. Crepitation, too, can ordinarily be elicited in fracture, but not in dislocation. Another important diagnostic sign, is the presence of a fissure or depres-

sion detected by passing the finger along the spine of the scapula, whereas, no irregularity or depression is felt in case of luxation, but rather an unusual prominence of the acromion.

Ligamentous instead of osseous union generally results in consequence of the difficulty experienced in keeping the fragments in perfect apposition.

Treatment.—The leading indications in the treatment of this lesion are, first, to secure the arm and forearm firmly to the antero-lateral part of the chest; secondly, to raise the humerus firmly against the top of the shoulder joint, in order that its head may serve as a splint for the broken process. For this purpose, the same bandages, etc., are to be applied as for fracture of the clavicle, except there shall be *no pad in the axilla*, lest the broken fragment be pushed too far outward. Union is almost always ligamentous, in consequence of the difficulty of keeping the parts in complete apposition. Velpeau's bandage answers a good purpose in this accident. In applying this bandage, the hand of the injured side is made to grasp the sound shoulder, a compress or piece of muslin intervening between the side of the chest and injured arm, to prevent excoriation from contact and perspiration. Then place the initial end of a roller ten yards long and two and a half inches wide, under the axilla of the sound side, over the back and injured shoulder, down the front and outside of the arm, under the outside of the elbow up and over the chest, to the sound axilla, as is shown in Fig. 305. Passive motion should be begun in about three weeks, or as soon thereafter as can be safely instituted.

Fig. 305.

Fracture of the Coracoid Process is an accident of such extremely rare occurrence that its existence has been called in question by some very worthy authorities. Comparatively recent dissections, however, show that this form of injury does sometimes result in consequence of severe mechanical force, though it

is evident from the situation of the bone, that it is exceedingly liable to be accompanied by serious complications.

The symptoms pointing to this condition, are preternatural mobility, want of power to elevate or adduct the arm; crepitation, elicted by moving the head of the humerus, with the finger placed between the deltoid and pectoralis-major. Depression of the fragment can also be detected in the axilla, especially if there be severe rupture of the coraco-clavicular ligaments, in which event, the broken portion will be drawn considerably downward by the action of the pectoralis-minor, short head of the biceps, and the coraco-brachialis.

Treatment.—The treatment consists in keeping the elbow well raised, the arm and forearm being confined to the front of the chest by means of a bandage and sling, thus fulfilling the indications by taking the tension off from the three muscles producing the displacement. The scapula should also be confined by a few turns of a roller. Provided, there be serious complications, as fracture or dislocation of other bones about the shoulder; treatment of this particular injury is to be regarded as of secondary importance. Union by ligamentous formation has prevailed in all the cases heretofore reported.

Violent inflammation, which may be serious in its termination, is apt to follow this accident, owing to the injury done the axillary vessels, nerves and glands. Two cases of this accident are reported by Dr. Dugas, of Georgia, which were followed by paralysis of the limb, and cessation of pulsation in all its arterial trunks. In consequence of neglect of treatment, no union took place, the arms never having regained their functions. When matter forms in the axilla, an early and free incision at its most dependent part is advised. Passive motion should be instituted in two to three weeks, according to circumstances and should be cautiously done at the outset.

Fracture of the neck of the Scapula—a rare accident, in which the glenoid cavity and coracoid process are detached from the body of the bone—gives rise to a train of symptoms, as follows: There is flattening of the deltoid, the acromion is unnaturally prominent, and the head of the humerus can be distinctly felt in the axilla, giving the limb a somewhat lengthened appear-

ance. The coracoid process occupies a position below the clavicle, between the deltoid and pectoral muscles. Crepitation is produced by placing the hand on the shoulder, and rotating the arm upon the scapula, while the deformity is readily removed by pressing the humerus directly upward; the displacement, however, immediately recurs so soon as the arm is allowed to hang by the side.

Diagnosis.—This accident is distinguished from dislocation of the head of the humerus into the axilla, by the fact that in fracture the parts can be easily restored to their normal position, but assume their abnormal relations as soon as external support is removed. In fracture, also, crepitation is more or less easily detected, but is always absent in dislocation. In fracture, the shoulder can be moved freely; in dislocation, there is immobility. It is moreover liable to be confounded with fracture of the neck of the humerus; the distinction is to be made by observing that in the latter injury there is shortening instead of lengthening of the arm, while the shoulder also retains its natural appearance. Extreme pain, says Dugas, in the side of the chest, as well as down the fingers, occurs from injury to the axillary nerves. In one case coming under his care, there was no pulsation in the arteries, and insensibility below the elbow and partially so above.

Treatment.—The shoulder must be supported by the same sling, bandage and pad, that are used for fracture of the clavicle. It is managed in the same manner as this fracture, by keeping the elbow well raised, a pad being placed in the axilla, and the scapula thoroughly steadied until reunion has been effected. It is exceedingly difficult to retain these broken fragments in apposition, and stiffness of the joint is liable to follow, with atrophy, and paralysis of the arm, and other disagreeable symptoms. Passive motion should be instituted at the end of three weeks, and cautiously kept up. Consolidation may be expected in two months.

If the parts are much contused, *Arnicated* lotions should be continuously applied until the soreness has passed away; after this, a lotion of *Symphytum* should be applied to the part, by means of a compress, saturated with the remedy. It should be administered internally, as its action will have a salutary influence

in assisting, or rather stimulating bony reunion. I have employed this remedy for fracture of other bones, when the reparative process appeared slow and uncertain, with the most satisfactory results, and believe, in the fracture of all bones, indisposed to ossific reunion from various causes, that this remedy possesses superior efficacy.

Fracture of the body of the Scapula rarely occurs. When produced, however, it results from violence, directly applied, which is ordinarily of so severe a character as to occasion serious contusion or laceration of the soft textures. In consequence of the nature of this accident, the *symptoms* are liable to be greatly obscured by the rapid supervention of swelling, while it is also to be observed that owing to the peculiarity of the muscular attachments of the bone, the fracture is rarely accompanied by displacement of the fragments, especially if traversing the body, below or above the spine, or through either of the angles. The principal reliance is to be placed upon digital examinations in this case, at the same time causing the scapula to occupy different positions, by varying the movements of the arm. Thus, the superior angle is rendered prominent, by carrying the hand of the affected side over the sound shoulder, while the inferior angle is made to project, by placing the forearm across the back, having the elbow well elevated. Efforts should be made to detect crepitation, by grasping one portion of the scapula, while the arm is moved freely in various directions.

Treatment.—The leading indication in the treatment of this accident, is to steady the shoulder-blade, by the use of two large, narrow, and moderately thick compresses, placed along its axillary and vertebral borders, and confined by a broad roller, carried around the upper part of the trunk ; or, instead of this, they may be secured by means of large adhesive strips. The arm and forearm are then fastened to the anterior part of the chest, as in fracture of the clavicle.

Inflammation of the part must be combatted by the usual remedies, and if fever be present, *Aconite* is indispensable.

After inflammation of the part has subsided, *Symphytum* may be profitably given, two or three times a day, in the higher attenuations, as recommended in a previous article, and contin-

ually applied locally, until abundant evidence is offered of its complete union.

SECTION III.

FRACTURES OF THE HUMERUS.

Fractures of the humerus are of somewhat frequent occurrence, and constitute an accident demanding the closest attention, in view of the importance of the limb implicated. The symptoms attending the injury will vary according to the seat of the fracture, while there will also be a corresponding change in the line of treatment to be pursued. Hence, it is convenient to consider fractures of this bone as occurring, 1. Through the head and anatomical neck; 2. Through the surgical neck; 3. Through the shaft; and, 4. Through the condyles.

As some confusion has resulted in consequence of an ambiguous use of terms, it is proper to state that by the "head" of the humerus, is meant the smooth, spherical surface received into the glenoid cavity of the scapula, and which is limited below by the "anatomical neck," the latter representing the narrow line corresponding with the insertion of the capsular ligaments, and separating the "head" from the tuberosities.

The "surgical neck" is the portion intervening between the lower margin of the tuberosities, and the insertion of the pectoralis-major and latissimus dorsi muscles.

§ 1.—FRACTURES OF THE HEAD AND ANATOMICAL NECK.

Fractures of this portion of the bone have been known to result from direct mechanical violence, as falls or blows received upon the shoulder. The accident is also liable to be produced by the penetration of balls, a compound fracture being thus occasioned, which is generally of so severe a nature as to break the head into fragments, and ultimately to necessitate its removal.

The head of the bone in this injury, is subject to various displacements, being often turned upon its axis, or perhaps completely rotated in its socket. More commonly, however, it is found to be firmly impacted, or driven into the cancellous structure of the inferior fragment.

Symptoms.—The symptoms attending this form of fracture, are not usually so well marked as to render the diagnosis clearly apparent without instituting the most careful examination.

In general, however, the most prominent signs consist in deformity of the shoulder joint, a twisting of the axis of the arm, together with more or less flattening of the deltoid. Efforts to elicit crepitation should be made by placing the fingers upon the head of the bone, so as to press it firmly into its socket, at the same time effecting rotation of the arm. Slight shortening of the limb results frequently in consequence of impaction of the head of the bone, between the tuberosities of the lower fragment, while the functions of the arm are more or less impaired.

Fractures of the humerus may with propriety be divided into those of the upper articular extremity, the shaft, and the condyles.

The fractures of the upper extremity, are those occurring *within* and those occurring *without* the capsule.

Within the capsule, or *intra-capsular*.—The fractures within the capsule are, the *simple* fracture of the anatomical neck, and *impacted* fracture of this portion of the bone.

Without the capsule, or *extra capsular*—are fractures of the surgical neck, simple and impacted, and separation of the great tubercle from the head of the bone.

When fracture takes place within the capsule, which fortunately is exceedingly rare, the diagnosis is very difficult, the impairment of the motions of the joint, crepitus, loss of motion of the shoulder, swelling, pain, more or less deformity about the shoulder, and an irregularity produced by the upper end of the lower fragment, with more or less shortening of the arm, are almost the only symptoms indicative of this injury. If the fracture be entirely intra-capsular, bony union cannot well occur, and the detached head of the humerus is apt to become carious or necrosed, requiring an operation for its removal.

In *impacted* fracture, the upper fragment penetrates the lower one, producing a twisted appearance of the arm, the axis of the humerus is directed slightly inward, toward the axilla. The head of the bone can be felt in the glenoid cavity, but it is not in the axis of the limb; the elbow projects slightly from the side, and

a hollow is felt under the acromion. Crepitus can only be detected by firmly grasping the shoulder and rotating the elbow.

Fracture without the capsule or extra-capsular.—In these injuries the bone is broken through the surgical neck, and strictly involves that portion of the bone uncovered by the capsular ligament, or that portion of it which is below the tubercles, but above the insertion of the pectoralis-major and latissimus dorsi muscles. This accident may occur in children as well as in adults; in the former the separation taking place through the line of junction between the epiphysis and the shaft of the bone. In this fracture, the displacement is double, the head of the bone and upper fragment being rotated outward, and drawn thither by the action of the muscles inserted into the great tuberosity, while the shaft is drawn upward and inward, under the coronoid process by the muscles passing from the trunk to the arm, and by the flexors of the limb.

All of these fractures, except the intra-capsular, usually unite by bone although it would appear otherwise, the head of the humerus being deprived of all vascular connection and means of support. The circulation is probably kept up through the untorn ligamentous bands surrounding and attached to the neck of the bone. In *impacted* fracture, bony union readily takes place. In these fractures, the patient should be informed that some deformity with more or less loss of motion, will most probably ensue.

In aged persons the head of the bone is sometimes not only broken off, but thrown down into the axilla, where it forms a distinct tumor, which may readily be felt by the fingers, but which does not obey the motions of the arm. The absence, of a rounded tumor in the axilla, and the impossibility of feeling the glenoid cavity, are the distinguishing features of luxation.

Treatment.—The management of these fractures is to be conducted on the same general principles that are laid down in the treatment of those occupying the surgical neck of the bone, to which the student is referred for the necessary details.

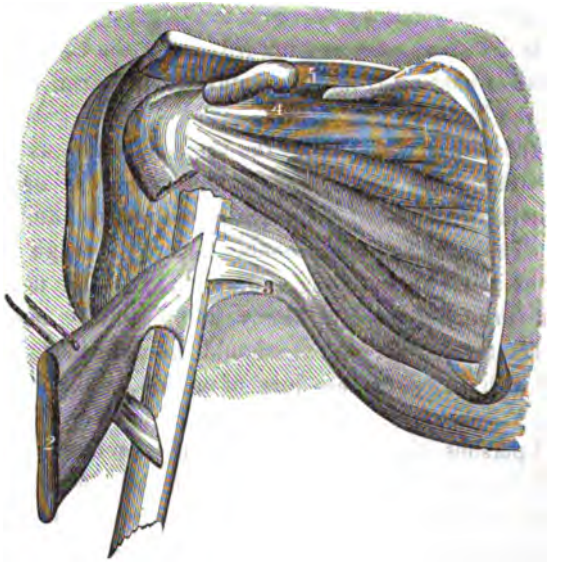
§ 2.—FRACTURE OF THE SURGICAL NECK.

Fracture of the surgical neck of the humerus, included between the lines of epiphysial junction and the insertion of the latis-

simus dorsi muscle, is an accident of no uncommon occurrence, and is readily distinguished by the following

Symptoms.—The *deformity* is usually considerable and characteristic; first, there is a marked angular displacement, resulting from the combined action of the pectoralis-major, latissimus dorsi and teres-major muscles upon the inferior fragment, drawing it toward the axilla; while the superior fragment is slightly elevated under the coraco-acromial ligament, by the muscles attached to the tuberosities of the bone, thus producing a distinct projection in front of the joint. The action of the deltoid and flexors, also

Fig. 306.



A FRONT VIEW OF THE RELATION OF THE PARTS CONCERNED IN A FRACTURE OF THE SURGICAL NECK OF THE HUMERUS.—1. Deltoid muscle. 2. Pectoralis-major dissected off from its origin and turned over the humerus so as to show its insertion. 3. Insertion of the latissimus dorsi muscle. 4. The subscapularis muscle. 5. The supra-spinatus, as seen behind the clavicle. (After Hines.)

serve to draw the upper portion of the lower extremity of the humerus upward and inward, causing the elbow to project somewhat from the side. The condition of the parts is well represented in Fig. 306.

Second, the axis of the limb is more or less changed, being directed in front of the natural line.

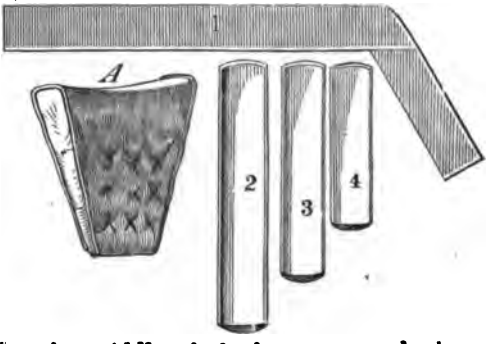
Third, shortening, though not an invariable sign of this injury, is often apparent, being due to the contraction of the deltoid, biceps and triceps muscles.

Crepitation can ordinarily be detected by simply rotating the arm, or by elevating the bone and carrying it outward. In addition, the patient is found unable to exercise the functions of the arm and hand; severe pain is experienced in the shoulder or at the immediate seat of the fracture, while there is also more or less contusion and ecchymosis of the parts.

Prognosis.—The prognosis is usually favorable, but the greatest care should be exercised in the treatment of such cases, in order to prevent deformity of the shoulder.

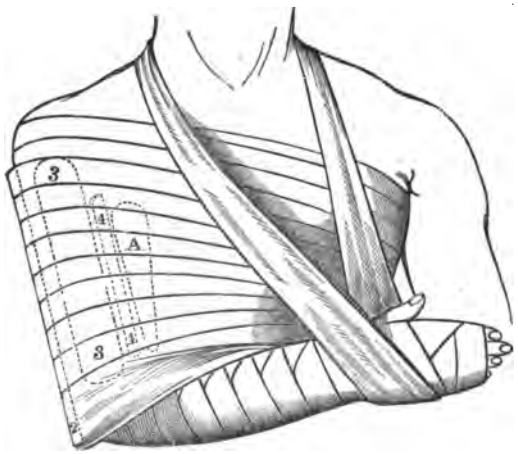
Treatment.—In treating fractures of this nature we must employ such means as will best overcome the action of those muscles which tend to produce the deformity, and at the same time, give support to the parts when placed in their natural position. The dressings which have proved most useful in my hands have been the splints, shown in Fig. 307, together with a pad similar in shape and size to that used for fracture of the clavicle. This will act, both as an inside splint, and as a support to the upper end of the lower fragment. Of the four splints in Fig. 307, one should be angular, and reach to the middle of the humerus on the inner side, so as to keep the elbow at rest, while the three straight splints should be of sufficient length to reach from the upper part of the shoulder to the elbow, but not so long as to interfere with the flexion and extension of the forearm. They may be made of wood, pasteboard, gutta percha, tin, wire, or any material, so that they be adapted as perfectly as possible to the limb. Cloths saturated with gum arabic, or plaster of Paris, moulded to the limb and permitted to harden, have been highly recommended.

Fig. 307.



The splints should be light, of such a shape as to fit the convexity of the arm, and of sufficient strength to afford firm support to the broken parts. The limb should be bandaged from the fingers up to prevent œdema, and the splints "well padded," carefully applied, and secured in their places by spiral turns of the roller, extension and counter-extension being kept up by the aid of assistants. If the lower fragment of the broken bone is drawn inward the pad is placed in the axilla with its thick end up. If the upper fragment is drawn inward its position is reversed. If there is but little deviation of the fragments the pad may be omitted and its place filled by a well-padded splint. In all cases the parts should be well washed with soap and water before the splints are put on, and whenever they are removed, otherwise, the retained perspiration may cause an intolerable itching and tempt the patient to loosen the bandages in order to scratch the parts. The arm is now secured to the side of the chest by a few circular turns of the roller, as shown in Fig. 308. The wrist is supported in a sling, the elbow left free, that by its weight it may prevent overlapping of the fragments and prevent shortening of the limb. Care should be taken to prevent false anchylosis of the elbow joint, and passive motion instituted about the end of the third week. Firm union may be usually expected in about five weeks.

Fig, 308.



FA VIEW OF THE DRESSING FOR FRACTURE OF THE SURGICAL NECK OF THE HUMERUS as applied to the body. The dotted lines show the apparatus inside the turns of the roller which binds the arm to the body. A. The pad in the axilla. 2, 3, 4. The splints in position, as previously seen in Fig. 307. The hand is supported by a sling. (After Nature.)

The late Prof. E. A. Clark, of St. Louis, has devised the fol-

lowing ingenious manner of treating these fractures, which he claims to be superior to any hitherto known method. He says "the appliance consists merely of two strips of adhesive plaster about three inches in width, applied to the internal and external surface of the arm as high as the upper part of the middle third of the humerus." Fig. 309.

Fig. 309.

"These strips are bound to the arm by a roller bandage, and at their lower end, beneath the point of the elbow, are attached to a cord, to which a sand-bag is suspended, weighing, ordinarily, from three to four pounds. This sand-bag, as represented in the diagram, is attached close to the point of the elbow when the patient wishes to walk about, by knotting the cord by which it is suspended, and when he lies in bed, the knot in the cord as seen in the cut, is loosed, and the cord carried beneath the bed-clothing over a small pully placed at the foot of the bed, and in this way an equal extension is constantly kept up, whether the patient is confined to his bed or is able and prefers to walk about."

"When using this apparatus for treating these fractures, I apply no other dressing, and entirely ignore the compress in the axilla as useless, if not positively injurious, when the upper end of the lower fragment is displaced outwards. The constant traction upon the muscles soon exhausts their tonicity, so that they allow the fragments to fall into their natural position, while the extension being constantly in the line of the axis of the humerus, it is quite impossible that any displacement should continue, either laterally or of an angular character, or that any shortening should

result. I have treated several cases of fracture of the head of the humerus on this plan, and with uniform good results. The first patient on whom I applied the dressing—and which illustrates sufficiently the progress of the cases treated subsequently—was a stout muscular man, aged thirty-three years, who had fallen some twelve feet striking the point of the shoulder upon the ground, causing considerable contusion of the soft parts, besides fracture of the bone. At the end of seven weeks the dressing was removed and the union in the fracture found to be firm, without any displacement or shortening, and in ten days after, the patient was discharged from the hospital with perfect use of his arm."

Erichsen uses a pad, a leather shoulder-cap and a sling, while Hamilton employs a simple outside splint of gutta percha without any pad. Welch's shoulder splint has also been recommended in the treatment of these injuries.

Treatment.—The after-treatment must be conducted on the same general principles already given, deviations occurring only in case of any unpleasant symptoms that may arise, which will have to be treated accordingly.

§ 8.—FRACTURE OF THE SHAFT.

Fracture of the shaft of the humerus may result in consequence of direct violence, from falls upon the palm of the hand, or from muscular contraction. The injury is comparatively easy of diagnosis and treatment, and proper care being exercised, generally results in reparation without deformity or impairment of function. The fracture is usually oblique, unless occasioned by muscular action, when it is more likely to be transverse.

Symptoms.—Deformity, preternatural mobility, and crepitation, the three characteristic signs of fracture, are commonly well defined in this accident. The *deformity*, however, depends much upon the precise point and direction of the fracture; thus, if the separation of the bone occur immediately above the insertion of the deltoid, the lower fragment is liable to be drawn upward, and slightly outward by the action of this muscle, while the superior fragment is carried somewhat inward by the pectoralis-major. But, if the fracture occur below this point, which

is more common, and is oblique, there is considerable displacement, the conjoined action of the biceps, brachialis anticus, in front, and the triceps on the posterior aspect of the arm, serving to draw the lower fragment upward, over the superior fragment, producing a shortening of the limb, varying in extent from a quarter of an inch to an inch and a half.

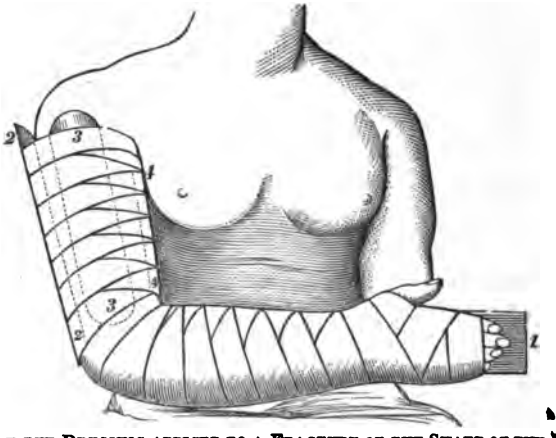
Mobility at the seat of the fracture is readily detected by grasping the limb, both above and below this point, and moving the fragments in opposite directions, which manœuvre also will ordinarily serve to elicit distinct *crepitation*. In addition, there is pain, together with complete loss of function, the patient being obliged to support the limb by the assistance of the opposite hand.

Prognosis.—The prognosis is to be especially guarded in fractures of the humerus, owing to the difficulty so often experienced in securing bony union of the fragments, while a greater or less degree of shortening is very frequently met with. Concerning this point, Malgaigne remarks that, "when there is great obliquity with overlapping, or a fracture with splintering, or a multiple fracture, a certain amount of deformity is inevitable, and the formation of callus demands one or two weeks more. With the inflammation comes also the danger of suppuration, and later, a rigidity of the articulations, difficult to dissipate. In short, we must not forget that of all fractures, those of the humerus are most liable to fail of consolidation," and especially so, when they occur near the point of entrance of the nutritious artery of the bone.

Treatment.—In treating fractures of the shaft of the humerus, four splints will be required. An angular splint, "which is to be applied to the front of the arm," of sufficient length to reach from the axilla to the ends of the fingers, and three splints of the length of the arm, which are to be applied respectively to the back part, the outside and the inside of the arm. These should be of light material, and moulded to fit that portion of the arm to which they are to be applied. These splints being well padded and ready for use, extension and counter-extension are made by assistants, and the arm carefully bandaged from the fingers to the axilla. This bandage performs the double office of preventing

œdema and controlling the action of the muscles. The splints are then placed in position, as described above and shown in Fig. 310, and firmly secured in their places with the roller The forearm is then carried across the chest and supported by a sling.

Fig 310.



A VIEW OF THE DRESSING APPLIED TO A FRACTURE OF THE SHAFT OF THE HUMERUS.—1. The front angular splint. It should be represented with the palm of the hand turned up to the chin of the patient. 2, 2. The splint on the back of the arm. 3, 3. That on the outside. 4. That on the inside of the arm, the position of the arm across the chest making it appear to be placed toward its inner side, but this is the seat of the angular splint which keeps the elbow at rest. (After Nature.)

The angle of the long splint should be changed from time to time, in order to prevent stiffening of the elbow joint, which is liable to ensue if the joint is confined too long in one position.

§4.—FRACTURE OF THE CONDYLES.

Fracture of either one or both of the condyles of the humerus is by no means an accident of uncommon occurrence. It may result from a fall upon the point of the elbow, by a direct blow, or by the parts being crushed between two opposing surfaces. Not unfrequently, also, the injury has been produced in consequence of falls upon the palm of the hand, the limb being in an extended position.

Fractures of this character generally occur in children, and constitute serious injury, owing to the danger of high inflammatory action, which is exceedingly liable to extend to the joint, occasioning a free effusion of lymph, and subsequent adhesions, thus producing more or less complete anchylosis of the elbow.

Symptoms.—After injury in this joint, the parts will be found hot, swollen and oftentimes discolored, with pain increased by motion, the patient screaming on the least movement of the articulation.

When *both condyles* are severed, there is more or less marked deformity, the radius and ulna having the appearance of being dislocated backward; a depression exists in front of the joint; the forearm is somewhat flexed, while the motions peculiar to the elbow are almost completely lost. The joint also presents the appearance of being increased in width.

Another important diagnostic sign relative to this deformity is observed by flexing the arm and drawing a circular line from one condyle to the other, when the prominence of the olecranon will be found to fall either above or below this line, whereas in a normal condition of the parts these three points correspond with each other.

Crepitation, which can ordinarily be detected by simply flexing and extending the forearm, or by effecting rotation, will serve to assist the diagnosis, while the latter may be still further confirmed by the application of extension and counter-extension, when the deformity will materially if not completely disappear, but return immediately after the extending force is discontinued.

The *inner condyle* is sometimes alone the seat of fracture, in which case the detached portion of the bone forms a distinct tumor on the posterior aspect of the elbow; the ulna projects considerably backward when the forearm is extended, while there is a corresponding advance of the lower extremity of the humerus. The deformity thus occasioned, however, disappears almost completely upon flexing the elbow. There is also a slight increase in the width of the joint, while crepitation is easily elicited owing to the mobility of the fragment.

Fracture of the *external condyle* may result in displacement of the detached portion backward, forward, or outward, while in one case coming under my observation there was a slight displacement downward. A distinct tumor is formed by the abnormal situation of the condyle; crepitation results on rotating the forearm, while the hand occupies a supine position, the elbow being somewhat flexed.

Prognosis.—The prognosis should be guarded, as in a large proportion of cases a more or less complete anchylosis will inevitably result, which will, however, have a tendency gradually to diminish. The union generally occurs by the interposition of a bony callus, although frequently it is accomplished by a ligamentous deposit.

Treatment.—The indications in the treatment of fracture of the condyles is to overcome the action of the triceps, thus preventing any dislocation of the bones of the forearm, and to keep the arm at rest, in order to prevent extensive inflammation of the elbow joint. The splint most frequently used is the angular splint, to be applied to the front of the arm, which, by means of a hinge, can be placed at any angle desired. The use of this splint not only serves by pressure at the elbow to prevent dislocation backward, but prevents ulceration of the integuments over the condyles, an accident very common when the side splints are used. The broken fragments having been returned to their places, by the use of extension and counter-extension, the arm is bandaged as in fracture of the shaft of the bone; the splint well padded, especially at the elbow, is then applied and retained in its place by the use of the roller. Fractures of this nature require to be constantly watched, and the bandage examined from day to day in order that it may be changed if too tight or too loose. The after-treatment of this injury will often demand gentle passive motion as will secure the flexion and extension of the forearm, as well as pronation and supination of the hand. To this end, passive motion should be commenced after the fifteenth day, and in those cases where the injury is not so severe, at the tenth or twelfth day.

Compound fracture of the condyles are serious injuries and require the utmost watchfulness and care of the surgeon. If extensive laceration of the soft parts accompany the fracture it will not be well to envelop the arm in splints. It should be simply laid down upon a hair pillow or folded counterpane in a semi-flexed position and the treatment recommended for Lacerated Wounds, vol. 1, page 638, employed. Where the injury is not so severe, a curved splint, or one of pasteboard or gutta percha, may be advantageously applied to the arm and retained in position by a few turns of the spiral roller. If the soft parts should be extensively torn,

and contused, the bones comminuted, and the nerves of the part lacerated, with injury to the principal artery of the limb, resection of the bones of the joint may be performed, if necessary; or, in the event of inability to save the forearm, amputation will be demanded.

Compound fractures of the arm rarely give rise to serious trouble or require amputation and must be treated on the general principles already recommended. In all these fractures *Symphytum*, as already stated, affords advantages that cannot be met by any other known remedy, especially after the worst of the inflammatory trouble has been combatted by appropriate remedies.

SECTION IV.

FRACTURES OF THE FOREARM.

§ 1.—FRACTURES OF BOTH BONES OF THE FOREARM.

Fracture of the radius and ulna, may occur in any portion of their extent, though commonly the seat of injury is at some point below their superior third. The reason of their being more frequently broken in this situation, is owing principally to the fact that the upper part of the forearm is well protected by a firm mass of muscular tissue. The fracture is generally oblique, and rarely takes place at the same point in each bone, especially if the accident result in consequence of counter-stroke.

The most common cause of this fracture, is a fall upon the palm of the hand, the limb being in an extended position. The injury is also produced by direct blows, or by catching the forearm in a wheel or in machinery.

Symptoms.—The symptoms are so well marked as rarely to admit of error in forming a diagnosis, there being more or less displacement, preternatural mobility, and crepitation.

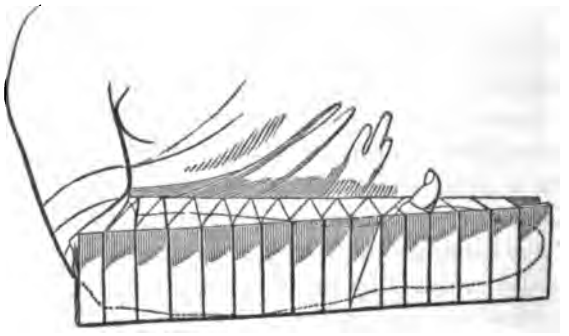
The lower fragments may be drawn upward, forward or backward, according to the particular direction of the fracture, while at the same time, the extremities of the bones are drawn together by the action of the pronator quadratus. Semi-flexion of the forearm, severe pain, infiltration of blood into the cellular

tissue, and loss of function, also accompany this form of injury.

Prognosis.—In the majority of cases, the prognosis is favorable, consolidation of the fragments ordinarily occurring in twenty-five or thirty days. The principal danger to be guarded against is the approximation of the broken extremities of the bones into the interosseous space, which, if allowed to unite in this position, will more or less completely destroy the function of rotation. Cases are also occasionally met with in which union of one or both of the bones is indefinitely delayed, or perhaps never accomplished; while, more rarely, apparently simple examples occur which result in complete loss of limb.

Treatment.—In simple fracture of the forearm, but two splints are required, one for the front and one for the back of the arm. These splints should be a little wider than the limb, and long enough to reach from the condyles to the extremities of the fingers, and be well padded along the center line, corresponding with the interosseous space to prevent the bones from impinging upon that space. Fig. 312.

Fig. 312.



A view of the splints, etc., as applied in the treatment of a Fracture of one or both bones of the Forearm. (After Nature.)

The fracture having been reduced by extension and counter-extension, the forearm is placed in a position midway between pronation and supination, the thumb pointing directly upward, and the splints well padded, applied and secured in their place by the use of the roller. The arm is then to be supported by a sling. The dressings should be changed from time to time, and every precaution taken to prevent

chafing of the skin. No bandage should be employed underneath the splints and the dressing should be renewed every other day for a fortnight. A *perfect cure* of fracture of both these bones is rarely attained, but this treatment produces as good results as any other, and is exceedingly simple and easy of application.

§ 2.—FRACTURE OF THE SHAFT OF THE RADIUS.

Shaft.—The radius may be broken without being complicated with fracture of the ulna, and is the most common injury of this class to which the forearm is subject. Simultaneous fracture of both bones occurs next in frequency, while fracture of the ulna alone is a comparatively rare accident.

The **seat** of fracture of the radius is commonly in the lower half of the bone, the cause being generally due to a fall upon the palm of the hand, though it occasionally results from direct violence.

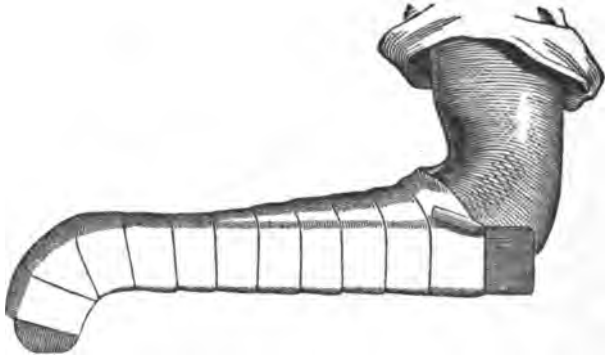
Symptoms.—The **symptoms** are ordinarily well marked, there being more or less angular deformity, with a tendency on the part of the lower fragments to approach the ulna; together with preternatural mobility, crepitation, and loss of function. There is, however, no shortening of the limb in consequence of the situation of the ulna. The *displacement* of the upper fragment is occasioned by the action of the biceps and pronator radii teres, the former drawing it upward, while the latter carries it inward, causing it, also, to occupy a position midway between pronation and supination.

The lower fragment suffers more or less displacement inwards, owing to the contraction of the pronator-quadratus, the latter muscle producing, at the same time, more or less pronation. The supinator-longus has a tendency also to increase the distortion by elevating the inferior extremity of the bone, thus depressing still more the upper end of the fragment.

Treatment.—Fracture of the shaft of the radius in the middle portion of its extent, requires the same treatment as fracture of both bones of the forearm. The objects in the treatment, are to prevent the fractured ends of the bone from being pressed inwards towards the interosseous space, and to prevent the upper fragment from being more supinated or everted than the lower.

To effect this, one splint should be applied to the anterior, and one to the posterior aspect of the forearm, extending from the elbow to the extremities of the fingers, the hand being maintained in a state midway between pronation and supination. For this purpose the lower ends of the splints should be shaped somewhat like the handle of a pistol, thus affording an opportunity of pressing the hand downward, and forcing outward the lower end of the radius, thereby counteracting the tendency of the pronator-quadratus to draw it against the radial border of the ulna. Fig. 313.

Fig. 313.



Nelaton's Splint for fracture of the radius.

With attention to this point, the surgeon will hadly fail to effect a perfect cure.

The hand should be kept in a line with the forearm, and the thumb be directly upwards. The cure is generally completed in a month or six weeks.

Superior Extremity.—Owing to the protection afforded to this portion of the bone by the firm mass of superincumbent muscles, the upper extremity of the radius is rarely broken.

The **symptoms** are obscure. There is, however, a more or less marked deformity immediately below the elbow joint, the upper end of the lower fragment being drawn in front of the limb, by the biceps flexor muscle, causing a flattening of the muscular prominence in that situation.

The functions of pronation and supination are completely lost. To render the diagnosis certain, the best plan is to grasp the head of the radius with the thumb and index finger of one hand and to rotate the forearm with the other.

If there be fracture, its existence will be rendered evident by the head of the bone refusing to obey the motions of the inferior fragment. By adopting this manœuvre, it will hardly be possible to mistake the nature of the case, unless there be so much swelling as to prevent the bone from being felt, in which event the examination must be repeated when the tumefaction has measurably subsided.

Treatment.—In the treatment of fractures of the neck of the radius, the arm is placed in the same position, midway between pronation and supination, the same dressing being applied as in fracture of both bones of the forearm, care being taken that the splints extend as high up as possible, in order to form adequate support to the upper fragment of the bone. If there exists an uncontrollable disposition in the pronator-quadratus to draw the lower fragment into the interosseous space, it must be counteracted by the use of a compress, as heretofore recommended in the treatment of fracture of both bones of the forearm.

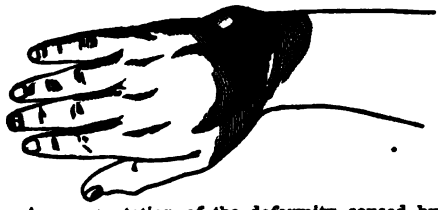
Lower Extremity.—Fractures of the inferior extremity of the radius present a great diversity as regards situation, direction, and extent; they are, however, comprehended under two varieties, one of which implicates the radio-carpal articulation, the other being seated immediately above this joint. The former is known as *Barton's*, the latter as *Colles's* fracture, each receiving its name from the writer who first accurately described it.

Barton's Fracture.—Two distinct fractures occur at this extremity of the radius, one *transverse* extending through the joint and chipping off the posterior margin of the articular surface, extending diagonally upward and across the bone until it terminates three quarters of an inch above the joint; the *oblique* extending nearly in the same direction, but only splitting off the portion of the articulation immediately connected with the styloid process, both of which are included in this variety of fracture known as Barton's.

Concerning the *symptoms* and *diagnosis* of this accident, Dr. Henry Smith has the following: "The patient complains of pain in the wrist, which is very marked in its character, though often regarded as due to a sprain, and, upon examination, a fullness is observed on the front of the wrist, looking not

unlike a swelling of the bursa, or of the tendons, while on the back of the hand there is but little deformity, more or less *lateral* displacement being always present, particularly if the styloid process of the ulna is broken in the manner described by Fig. 314.

Fig. 314.



A representation of the deformity caused by Barton's Fracture, showing its resemblance to a lateral and anterior dislocation. (From Nature.)

Diagnosis.—If, under these circumstances, the surgeon places a finger upon the head of the radius and pronates and supinates the *wrist*, the patient will not suffer greatly, and the head of the radius will be observed to rotate under his finger, because the attachments of the carpal, as well as of the interosseous ligaments, prevent such a separation of the fragments as would enable the lower fragment to be moved independently of the wrist. In consequence of this apparent continuity an inexperienced surgeon is liable to be deceived and be led to suppose that no fracture existed. But if, observing the facts just stated, he puts his finger upon the head of the radius, and then, *seizing the styloid process* of this bone and its carpal articular face with the finger of the other hand, rotates it gently, the head of the bone will be observed to remain stationary, while the fragment below will rotate, and create such violent pain that the diagnosis can at once be made."

With regard to the diagnosis of this injury from luxation of the radius forwards, a few words may be said. Barton's fracture is an accident of comparatively frequent occurrence, luxation of the radius rare, though the two may co-exist at the same time. The following facts will aid in the diagnosis of those doubtful cases which are occasionally met with:

If extension and counter-extension be employed with firm dorsal pressure above the line of the carpus, the deformity in this fracture will disappear just as that of a luxation might be expected to do; but as soon as these forces cease to act, the deformity will be reproduced in the fracture by the action of the extensors of the hand and fingers, which will not be the case in simple dislocations.

Besides this, the force sufficient to overcome the deformity in Barton's fracture is much less than that which would be necessary to overcome the deformity consequent upon simple dislocation.

Colles's Fracture.—In addition to Barton's fracture, continues Smith, "there is another fracture of the lower part of the radius, which was first noticed by Colles, of Dublin, in the year 1814.

He described it as occurring at a point about *an inch and a half above the wrist-joint*, not involving the articulation, and therefore differing in this respect from that of Barton. *Colles's fracture*, as it is now designated by European writers, produces a deformity which approaches in character that of Barton, though not precisely similar. In both, there is lateral displacement, this being most marked in Barton's; but in Colles's fracture, the fullness on the front of the wrist is not so marked as in Barton's, while that upon the *back* of the hand is much more so.

A fracture producing the same deformity as that attributed by Colles to the fracture which bears his name, has been more recently described by Smith, of Dublin, as a fracture of the radius *three quarters of an inch* above the articulating surface, thus also differing from Barton's fracture in not invariably entering the articulation and effecting the joint. The deformity produced upon the back of the hand is quite a peculiar one and has been graphically described by Velpeau as the "*fork-like*" deformity, in consequence of its general resemblance to the shape of the ordinary silver fork, presented by the back of the wrist and hand in these cases—a comparison which, however, does not apply to cases of Barton's fracture.

In the work of Smith, in Dublin, "On Certain Fractures as yet not Accurately Described," several cases of Colles's fracture will be found detailed and accompanied by drawings.* He says: "I cannot but think, however, that such a fracture that is described by Colles and Smith is much more rare than the fracture involving the articulation, and known in the United States

* Treatise on Fracture in the Vicinity of Joints, etc., by R. W. Smith, of Dublin, p. 147.

as that of Barton. Yet all these fractures somewhat resemble each other, and may be confounded: thus, all are fractures of the lower part of the radius; all create deformity about the wrist; all impair the motion of the joint, but the principal difference is to be found in the fact that one (Barton's) passes into the articulation, while the others (Colles's and Smith's) do not; that the pronator quadratus muscle is involved in the injury described by Colles and Smith, but not in Barton's fracture.

Owing to the proximity of the wrist-joint, all these injuries will however, if not well reduced, materially impair the motions of flexion of the wrist, as well as pronation and supination of the hand. Barton's will also create marked lateral deformity. Barton's fracture predisposes to a subluxation of the hand, externally and laterally; Colles's to one of the carpus anteriorly. Colles's creates the curve on the back of the hand that Velpeau has described as that of the "silver-fork," and both cause swelling of the anterior carpal bursa. When there is marked *lateral* deviation, the fracture will probably be Barton's, and must be remedied by counteracting the action of the thumb extensors.

Diagnosis.—The diagnosis of this fracture, and of course its proper treatment, requires close attention to the rules and explanations above given. Many surgeons doubtless, like myself, says Smith, have been "misled by ante-mortem examinations, and in case of a recent fracture reported by me,* such a deceptive sensation was given that all who examined the patient's arm regarded the fracture as that described by Colles. Yet the post-mortem examination demonstrated the injury to be that described by Barton. From similar deceptive sensations, Malgaigne was probably misled in his opinion about oblique fractures of this bone; and Hamilton, of New York, has also not been free from the same error of diagnosis, as he states† that he 'has not recognized this fracture in any instance which has come under his observation, nor has he been able to find a cabinet specimen in any pathological collection,' no post-mortem having been made by him in the accident. Four well-marked examples of this fracture are, how-

* Med. and Surg. Reporter, vol. ii, No. 1, April, 1859.

† Treatise on Fractures, p. 279, 1860.

ever, in my cabinet, with several others in the museum of the New York City Hospital, and show clearly the character of the injury. The difficulty of the diagnosis deserves therefore to be impressed on the mind of every practitioner in order to prevent deformity and an impaired usefulness of the hand of the sufferer."

Prognosis.—"With such evidence of the liability to error in sprains of the wrist and this fracture, as well as numerous instances of more or less marked deformity liable to supervene, the prognosis of the fracture should be guarded. As Mott, of New York, has stated, 'even when the fracture is well cured, an anterior prominence at the wrist or near it, will sometimes result;' while owing to the effusions in the bursa, thickening of the ligaments, etc., a more or less impaired condition of the wrist-joint will often continue for many months under the best treatment and most assiduous attention. In my experience, suits for malpractice in the treatment of this fracture are frequent, three having been brought to my notice in which the deformity complained of was due, in *two* to a defective pronation and supination, and in the *third* to false anchylosis and thickening of the anterior carpal bursa. When early recognized, this fracture may, however, be cured so as to give a perfectly useful hand. If unrecognized, there will probably be impaired pronation and supination, long-continued pain in the wrist, loss of power in seizing objects with the fingers, and in a scrofulous patient the development of disease of the carpal bones; and the danger of this result should be remembered in forming a prognosis."*

Treatment.—As the seat of Barton's and Colles's fracture, as thus described, continues Smith, "differs and the deformity also varies, the treatment might at first appear to be necessarily different. Yet this is not so. In both injuries perfect rest of the carpal articulation is necessary; in both, the equalization of the anterior and posterior surfaces of both the upper and lower fragments is essential to prevent deformity; and in both it is necessary to guard against inflammation of the carpal articulation and a tendency to luxation. With some little modification to meet

* Smith's Principles and Practice of Surgery, p. 590, *et seq.*

a lateral or posterior deformity, and promptly to prevent carpal arthritis, Barton's treatment, hereafter stated, will answer for both seats of fracture. Notwithstanding the same treatment may be advantageously adopted in both these fractures, I have thought best to present first, that of Hamilton and others, whose extensive practice and success in this direction, justly entitles them to great consideration, and secondly to give the views and treatment of Dr. Barton in respect to the application of the same dressing to both of these injuries.

Hamilton's method.—Having restored the fragment to its place by pressing forcibly upon the back of the lower fragment, the force being applied near the styloid apophysis of the radius, the arm is to be flexed upon the body and placed in a position of semi-pronation; when the splints are to be applied and secured by a sufficient number of turns of the roller, taking especial care not to include the thumb, the forcible confinement of which is always painful and never useful.

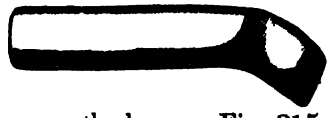
The practice of violent extension of the wrist in the efforts of reduction when no overlapping of the fragments exist, and that, whether the extension be applied in a straight line or with the hand adducted, cannot be too severely reprobated. It has been shown that in a great majority of cases, no indication in this direction is to be accomplished, and to pull violently under these circumstances upon the wrist, is not only useless but hurtful. It is adding to the fracture, and to the other injuries already received, the graver pathological lesion of a stretching, a sprain of all the ligaments connected with the joint. To this violence, added to the unequal and too firm pressure of the splints, are in a great measure, to be attributed the subsequent inflammation and anchylosis in very many cases. The first application of the bandages ought to be only moderately tight, and as the inflammation and swelling develop in these structures with rapidity, the bandages should be attentively watched and loosened as soon as they become painful.

It must be borne in mind that to prevent and control inflammation in this fracture, is the most difficult and by far the most important object to be accomplished, while to retain the fragments in place when once reduced is comparatively easy and

unimportant. During the first seven or ten days, therefore, these cases demand the most assiduous attention, and it is much better to dispense with the splint entirely than to retain them at the risk of increasing the inflammatory action. No doubt very many cases would come to a successful termination without splints, if only the hand and arm were kept perfectly still in a suitable position until bony union was effected.

Hamilton's apparatus.—He prepares a splint from a wooden shingle, cut into the requisite shape and length, the length being obtained by measuring from the front of the elbow-joint, when the arm is flexed to a right-angle with the metacarpo-phalangeal articulations. It ought, indeed, to fall half an inch short of the bend of the elbow, to render it certain that it shall not make uncomfortable pressure at this point; and the direction to measure with the arm flexed, is of sufficient importance to warrant repetition. The breadth of the splint should be throughout its extent just equal to the breadth of the forearm in its widest part so that there shall be no lateral pressure upon the bones. Fig. 315.

Fig. 315.



If the splint is of unequal breadth, the roller cannot be so neatly applied, and it is more likely to become disarranged. Thus constructed, it is to be covered with a sack of cotton cloth, made to fit tightly, with a seam along its back, and afterwards stuffed with cotton batting or with curled hair. These materials may be pressed in and easily adjusted, wherever they are most needed from the open extremities of the sack. While preparing the splint, it must be occasionally applied to the arm until it fits accurately every part of the forearm and hand, only that the stuffing must be rather more firm a little above the lower end of the upper fragment. The open ends of the sack are then to be neatly stitched over the ends of the splints, after which the splint may be laid directly upon the skin without any intermediate compresses or rollers. The advantages of this form of splint are easily comprehended. They consist in facility and cheapness of construction, accuracy of adaption, neatness, permanency, and fitness to the ends proposed. Fig. 316. The extemporaneous splint recommended by Dr. Hays, of Philadel-

Fig. 316.

Hamilton's Apparatus.

phia, is very similar, but it lacks the neatness and permanency of that which I have just described. In all cases it is better to employ also, at least during the first fortnight, a straight dorsal splint of the same breadth as the palmar splint and of sufficient length to reach from the elbow to the middle of the metacarpus. This should be covered and stuffed in the same manner as the palmar splint, except that there must be more thickness and firmness opposite to the carpus and the lower end of the lower fragment. It will answer the indication also a little more completely if at this point the padding is thicker on the radial than on the ulna side."*

Barton's Method. The dressing recommended by Barton consists of two compresses about three inches by two or else two and a half square, graduated from one end, and two splints prepared as in fracture of both bones of the forearm, together with a two and a half inch roller. One of these compresses is then placed on the front of the wrist with the thick end downward, a little above the articulating end of the radius, the other is to be placed on the back of the wrist with its thick end upward so that it may be on a line with the end of the other compress, so that one may begin where the other ends, though on opposite sides of the wrist. These are then fastened in their places by a few turns of the roller loosely applied. The two splints are then applied as in fracture of both bones of the forearm and confined in position by the spiral bandage as shown in Fig. 317. After the end of a few days the bandages may be tightened from time to time and slight motion made at the joint, in order to prevent anchylosis. In four weeks and a half, in favorable cases, the splints may be left off, but the arm should be

* Hamilton on Fractures and Dislocations, p. 276.

bandaged and supported with a sling for a couple of weeks longer when the patient may resume the use of the limb.

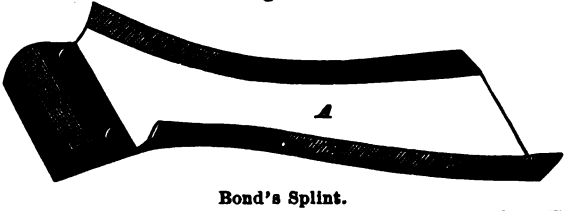
The splint suggested first by Bond, of Philadelphia, is a valuable addition; since the flexed position is always more easy for the fingers, and in case of anchylosis this position renders the whole hand more useful.

Fig. 317.

A VIEW OF BARTON'S DRESSING FOR FRACTURE OF THE LOWER END OF THE RADIUS, AS DESCRIBED IN THE TEXT.—A. The graduated compress. 1, 2. The thick end of each compress as applied to the wrist, and represented as seen through the splints and bandage, which retain them in position. (After Nature.)

Bond's Method. From a light board of proper thickness for a splint, cut a profile of the forearm and hand of the patient, extending the profile from the elbow downward, as far as the second joint of the fingers when these are moderately flexed, the lower end must then be cut off at an angle of fifteen or eighteen degrees. The board is then covered with sheeting. A block of soft wood from an inch to an inch and a half in thickness, and from two to two and a half inches wide, and carved and rounded, so as to adapt it to the form of the hand, and make it easy for the thumb, is then fastened to the lower extremity of the splint, so that the remote edge of it shall correspond exactly with the lower oblique end of the board. A piece of pasteboard, of sufficient width to extend beyond the edges of the board about an inch is now fastened to the whole length of the splint save that portion which is covered by the palm block, thus forming a

Fig. 318.



Bond's Splint.

sort of box in which the arm is to be placed. See Fig. 318. Two compresses will usually be required in this, as in Barton's

treatment. The compresses having been adjusted, the limb should be placed in the splint, and the roller applied commencing upon the lower fragment of the radius and carrying it down over the wrist, metacarpus, and the first joints of the fingers, leaving the thumb free, then returning to the upper end of the splint and attaching it in several places to the covering of the splint. If the compresses have been properly adjusted, it is not necessary when using this splint, to apply the roller with anything like the tension usually employed. Should the fracture occur so high up that there is danger of diminishing the interosseous space between the bones of the forearm, it will be necessary to use a dorsal splint. This should be of such a width as to effectually prevent the bandage from pressing upon the fragments in such a manner as to lessen the interosseous space, and it should be of sufficient length to reach from near the elbow to the hand, but not to extend upon the metacarpus. Should stiffness and difficulty of pronation and supination remain after treatment, passive motion should be employed daily, and the local circulation stimulated by means of medicated lotions of *Symphytum*, *Hypericum*, gentle exercise, the cold douche, &c., according to indications. From five to seven weeks are usually necessary for the treatment of these cases.

§ 3.—FRACTURES OF THE ULNA.

Owing to the superior strength of the ulna and its indirect connection with the wrist, fracture of this bone is far less frequent than that of the radius. It is, however, liable to be broken in any portion of its extent, the direction of the fracture being generally oblique.

The cause of the accident is commonly due to direct violence, though it may also result from falls upon the side of the arm, or from counter stroke, while one case is reported as having occurred in consequence of muscular action in wringing clothes.

The seat of the fracture is usually situated a little below the center of the shaft, though Hamilton found "in an analysis of thirty-three cases that the shaft was broken eleven times in its upper third, twelve times in its middle third, and ten times in its lower third."

Symptoms.—There is commonly a well-marked depression on the inner border of the arm, occasioned by the action of the pronator quadratus, which draws the lower fragment toward the radius. Crepitation and preternatural mobility are evinced by grasping the fragments above and below the seat of fracture and pressing them in opposite directions. Frequently, however, the deformity is so great as to be easily detected by sight, when the diagnosis is apparent.

Prognosis.—Provided proper care be exercised in conducting the treatment, the prognosis is generally favorable, as there is no shortening of the limb and rarely any considerable degree of displacement. There is, however, a tendency on the part of the inferior fragment to approach the radius and become attached to the latter, thus materially impairing the functions of the arm.

Treatment.—Fracture of the shaft of the ulna at its middle or lower third, requires the same treatment as described for fracture of both bones of the forearm. During treatment, care should be exercised that the upper end of the lower fragment does not lapse into the vicious position in which it is found at the time of the accident, pressing against the radius. To prevent this, the hand should be permanently inclined upward and toward the radius, which can be accomplished by the use of two broad and well-padded splints, a little sloping from behind forward, in a direction the very opposite to that employed in the management of fracture of the corresponding end of the radius. By the use of this apparatus the action of the inferior pronator muscle is overcome, and the lower fragment of the ulna is preserved in its natural position and in line with the upper portion of the bone. While extension is being made and the hand firmly supinated, the fingers of the surgeon should be pressed firmly, and in spite sometimes of the complaints of the patient, between the radius and the ulna, and the fragments of the broken ulna fairly pushed away from the radius. The forearm placed in a position midway between pronation and supination is to be suspended against the front of the chest. It should be borne in mind that in slinging the forearm in this position, the handkerchief should not press against the middle of the ulnar side of the bone, but support the limb by passing under the *hand* and *wrist*. The head of the

ulna is sometimes broken off, either separately, or along with the head of the radius. This accident is readily detected by mobility of the part, want of action in the joint, severity of pain, distortion and crepitus.

The treatment is conducted with two splints, *anterior* and *posterior*, applied with a compress upon each, placed directly over the seat of fracture.

§ 4.—FRACTURE OF THE OLECRANON PROCESS.

Fracture of the olecranon process of the ulna may be produced by falls upon the elbow, by blows inflicted directly upon the part, or by violent contraction of the triceps.

It may be broken at its base, at its summit, or through the middle of its extent, the latter being the most frequent seat of the injury. The fracture may also present a variety of forms, being transverse or oblique, single or multiple, simple or complicated. The amount of displacement, however, is due for the most part, to the degree of violence sustained, rather than to the seat of the injury or its variety, as the fracture may exist with comparatively little laceration of the ligaments, capsule, or aponeurosis of the triceps, in which case the deformity is slight.

Symptoms.—The patient at once loses the ability to effect perfect extension of the forearm upon the humerus, the power of flexion however, being ordinarily retained. The limb is held in a semi-flexed position owing to the action of the biceps and brachialis anticus, while an unnatural prominence exists above and behind the elbow in consequence of the detached fragments being drawn upwards by the contraction of the triceps, thus producing a more or less marked depression between the fragments, the interspace between them varying in extent according as the forearm is flexed or extended. Crepitation may be elicited by bringing the fragments into apposition, or by simply moving the process laterally, provided there be little or no separation of the bone, as when the fracture is above the ligamentous expansion of the triceps. The accident is generally attended by a considerable degree of pain and swelling, the latter often being so great as materially to obscure the diagnosis. In general, however, the true nature of the injury is ren-

dered apparent by the loss of function, the prominence produced by the detached process, and the consequent depression existing between the extremities of the broken bone.

Prognosis.—The union of the fragments in this fracture is generally fibro-ligamentous, the intervening structure varying in length from a line to an inch or more, thus interfering with the action of the triceps and rendering the patient unable to extend his arm completely; and even in the most favorable cases, the functions of the limb will rarely be as perfect as before the occurrence of the injury. "The cause of this kind of union is three-fold: *first*, the want of proper nourishment of the upper fragment; *secondly*, the difficulty of maintaining accuracy of apposition; and, *lastly*, the accumulation of an inordinate deposit of synovial fluid—all, but especially the first, interfering with the healing process." Provided, however, perfect approximation of the fragments can be preserved, osseous union will be likely to ensue.

The period required in ordinary cases, for reparation varies from six weeks to two months; while more commonly, many months supervene without a perfect restoration of the functions of the arm.

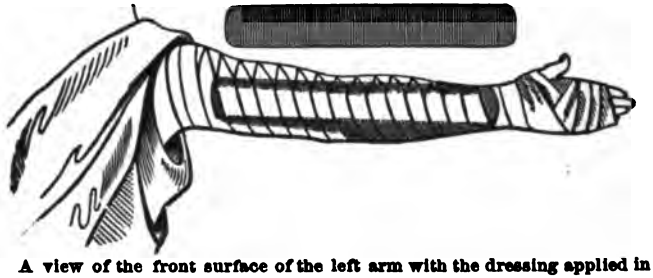
Great care is demanded in complicated cases, in order to combat successfully the resulting inflammation, as permanent anchylosis is particularly liable to ensue.

Treatment.—The treatment of this fracture consists in bringing the fragments in apposition, and retaining them by means of appropriate dressings, in obviating the tendency to inflammation and anchylosis of the elbow joint. Many dressings have been recommended. I shall only mention those most commonly used, that of Dessault, Sir Astley Cooper, and Boyer's.

Dessault's Dressing.—The arm being placed in an extended position, the surgeon attempts, by manipulation, to bring the parts in apposition with each other, care being taken that no fold of the skin is pinched between the fragments. This being accomplished the ordinary spiral bandage is applied from the wrist to the elbow. The joint is then covered by figure-of-8 turns of the bandage in such a manner as to hold the broken fragments in their places. The bandage is then entwined up the

arm in the ordinary manner to the shoulder in order to counteract the tendency of contraction of the muscles. A straight splint, well padded, and of sufficient length to reach from the middle of the arm to the middle of the forearm is then applied to the inner surface of the limb and secured in its place by the roller. Fig. 319. The dressings should be changed occasionally,

Fig. 319.



A view of the front surface of the left arm with the dressing applied in the treatment of fracture of the olecranon, showing the size and position of the splint. (After Nature.)

Symphytum lotions being continually applied to the parts. Passive motion should be cautiously made about the twenty-first day in order to prevent anchylosis of the elbow joint.

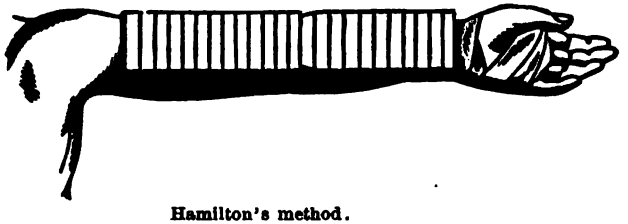
Sir Astley Cooper in treating fractures of this nature gives preference to the following treatment: The patient's arm being extended, the surgeon brings down the upper fragment until it is brought in apposition with the shaft of the ulna; a strip of linen is then applied above and below the elbow joint, and secured in their places by a few turns of the roller. These strips being now brought together and tied, serve to bring the rollers more closely together and thus retain the broken fragments in direct apposition. A well-padded splint, similar to that used by Dessault is now applied to the front of the arm and secured by a bandage.

The danger to be avoided in dressings of this kind is the ligation of the limb so tightlyas to interrupt the circulation and expose the parts to the hazard of swelling, ulceration, and it may be mortification. Without the tight application of the roller this dressing will be of little value.

These dangers may be avoided by the process given below, which has received the sanction of Prof. Hamilton, and which cannot be too highly recommended in this fracture.

It consists of a splint cut from a thin piece of board or a firm wooden shingle, fitted to the arm, and made long enough to reach from near the wrist joint to within three or four inches of the shoulder, and of a width equal to the widest part of the limb, which should be uniform throughout its entire length except at a point corresponding to a point three inches or thereabouts below the top of the olecranon process, where there should be a notch on each side, or a slight narrowing of the splint. One surface of the splint is now to be thickly padded with hair, or cotton batting so as to fit all of the inequalities of the arm, forearm and elbow, and the whole covered neatly with a piece of cotton cloth stitched together upon the back of the splint. Thus prepared, it is to be laid upon the palmar surface of the limb and a roller is to be applied, commencing at the hand, and covering the splint by successive circular turns until the notch is reached, from which point the roller is made to pass upwards and backwards behind the olecranon process, and down again to the same point on the opposite side of the splint. After making a second oblique turn above the olecranon to render it more secure, the roller may descend gradually, each turn being less oblique and passing through the same notch until the whole of the back part of the elbow joint is covered. This completes the adjustment of the fragments, and it only remains for the roller to be again carried upwards by circular turns until the whole arm is covered as high up as the top of the splint, as is seen in Fig. 320.

Fig. 320.

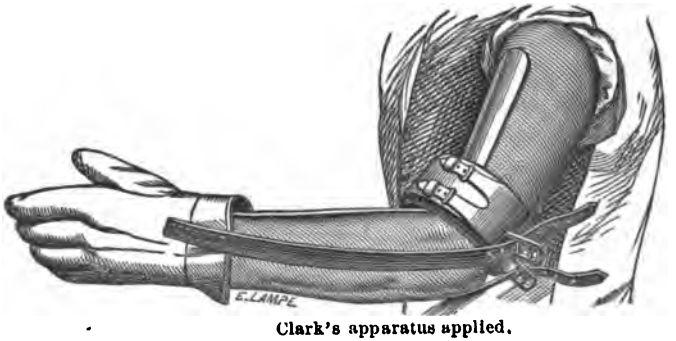


Hamilton's method.

The advantages of this mode of dressing are obvious; 1st, the broken fragments are kept in apposition as perfectly as by any other bandage; and, 2d, there is a space left on each side of the splint upon which no pressure is made, and the circulation of the limb therefore is not interfered with.

Before applying the dressings, which should be done immediately, the limb must be extended, the several fragments coaptated and a compress wet with *Symphytum* or *Arnica* lotion placed partly above and partly on the olecranon to keep down inflammation and to prevent the sliding of this process while the dressings are being adjusted. Care should be taken that a fold of the skin be not pinched up between the fragments. If the fracture is associated with severe injury of the soft parts, appropriate medicated lotions with the other means hitherto recommended for overcoming the local inflammation must be employed. It is necessary, therefore, to examine the bandages daily, and loosen or tighten them according to circumstances. It is better to cut the roller, when necessary, with a pair of scissors, than to unroll it, stitching the ends together again as tightly as desired. As soon as inflammation has subsided, the dressings should be removed, and before reapplying them, the surgeon firmly supporting the process, should gently and cautiously flex and extend the arm two or three times daily. This practice should be continued gradually, and increased from day to day until a change in the angle of the arm can be safely made.

The late Prof. E. A. Clark, of St. Louis, who favored the treatment of semi-flexion originated the following apparatus, which consists of a band of ordinary sole leather, three inches in width, of sufficient length to encircle the arm, lined with cloth or chamois and well padded, to one end of which is attached two small buckles to receive two corresponding straps on the other, by which it is fastened around the arm above the point of fracture moderately tight, so that extension being made upon it from below, the fragment will be drawn into its proper place. Two buckles or staples about two inches in length, and three-fourths of an inch in width, and placed one inch apart, are firmly and securely fastened upon the circular band, as represented in Fig. 321. A common buckskin glove with two leather straps attached as is shown in the figure, is placed upon the hand and buckled into the staples on the band. By buckling these straps over the bars at a greater or less distance from the band and tightening them as required, the necessary amount of leverage is obtained to turn the lower edge of the band in upon the arm and push the



Clark's apparatus applied.

fractured process down before it, making the force greater or less according to the amount of tension employed. The entire arm and forearm including the straps is to be encircled with a roller to hold the anterior splint firmly to the arm and to prevent any movement of the elbow joint, which, if permitted, would be constantly modifying the force exerted upon the fracture. In a number of cases treated by this method, by the author, a uniformly satisfactory result was given in each, which certainly establishes this apparatus as one of great value in the treatment of this injury. No passive motion of the joint was permitted at any period of the treatment, which usually lasted from twenty to twenty-five days. The apparatus may be employed in the fracture of either olecranon, and may be adapted to an arm of any size.

§ 5.—FRACTURE OF THE CORONOID PROCESS.

This is an accident of so extremely rare occurrence that many of the most worthy surgical authorities express doubts relative to the reported cases being true examples of that injury. Thus, Prof. Gross remarks that he has never met with the accident in the living subject, and is not aware that a solitary specimen of it exists in any of the osteological collections, private or public, in the United States.* Hamilton, of New York, who has investigated the subject somewhat extensively, refers to nine cases, concerning which he writes as follows: "The fact that so few cases have been reported, and that most of them are far from having been clearly made out, remains presumptive evidence that the actual cases are exceedingly rare; but if to this we add such

* System of Surgery, vol. i, p. 992.

negative evidence as is furnished by actual dissections, and by examinations of the pathological cabinets of the world, we think the testimony almost conclusive."

After giving an analysis of four specimens,—the only ones known—he continues: "We are therefore left as before, with no evidence that the coronoid process was ever broken by the action of a muscle, and with only one example in which it is probable that a fracture occurred as a consequence of a dislocation of the radius and ulna backwards. If then it does happen that in this dislocation it is pretty often found difficult or impossible to retain the bones in place without aid, it will be the part of prudence to ascribe this troublesome circumstance to some more common accident than a fracture of the coronoid process; perhaps to a fracture of some portion of the lower end of the humerus, or to a disruption, more or less complete, of the tendons of the biceps and branchialis anticus, together with the ligaments which surround the joint."*

Symptoms.—Provided, however. the accident should be met with, it is apparent from the situation and function of the surrounding structures and a study of the reputed cases, that the following group of symptoms will be exhibited: The detached fragment will be drawn upward by the brachialis anticus on a level with the coronoid depression of the humerus, where it will be felt as a movable body, especially if no considerable degree of swelling have ensued previous to the examination. Owing to the fact of the ulna's having lost the support of this process, it readily obeys the action of the triceps, thus producing a more or less complete dislocation backward, the olecranon forming a corresponding projection behind the elbow. Flexion of the limb is also impossible by the unaided power of the patient.

Prognosis.—In cases of uncomplicated fracture of this process, it is probable that a cure will result in the course of five or six weeks. But owing to the size and imperfect nourishment of the detached portion, together with its proximity to the joint, nothing but a fibro-ligamentous union will be likely to occur.

Treatment.—The broken fragment should be brought into

* Treatise on Fractures and Dislocations, p. 302 *et seq.*

position and confined by a few strips of adhesive plaster applied in the form of the figure-of-8 bandage. The forearm should then be bandaged from the fingers to the elbow, and the arm from the shoulder to the elbow, thus securing complete relaxation of the flexor muscles. The forearm and arm should then be placed in an angular tin or gutta percha case, and supported by a sling for the first eight or ten days, and kept at a right angle with the arm. After this a simple sling is all that is necessary, since from this period some motion must be given to the joint in order to prevent stiffness of the articulation. Sir Astley Cooper recommended motion to be begun after the third week, and Velpeau after the fourth, but Hamilton thinks that the "future mobility of the joint is vastly more important than the question of a bony or ligamentous union between the fragments." I am in the habit in all cases of dislocations involving the large articulations, to begin motion of the joint just as soon as the acute stage of inflammation has passed away: the first step being, of course, slow and gradual, and increasing from day to day.

During treatment care should be exercised to prevent the radius and ulna from slipping backward away from the condyles of the humerus. The usual medicated lotions should be applied as heretofore directed.

SECTION IV.

FRACTURES OF THE HAND AND FINGERS.

§ 1.—FRACTURES OF THE CARPUS.

Fracture of the carpal bones never occurs except as a result of direct violence, which is frequently of so severe a character as to produce complications necessitating immediate amputation.

The *diagnosis* of the accident is generally rendered easy by the presence of deformity, loss of function, and crepitation.

Reduction of the displaced fragments may be accomplished ordinarily by simple pressure and counter-pressure, and held in position by means of two splints, reaching from the middle of the forearm to the extremity of the fingers, the splint upon the

front of the wrist being well padded opposite the palm of the hand. The forearm should then be placed in a sling.

In the more severe cases, in which there is a considerable degree of comminution and laceration of the soft structures, nothing is demanded in the line of retentive means, except that a broad well-padded splint be placed upon the front of the forearm and secured by light turns of a roller, combatting the resulting inflammation by appropriate medicated dressings. Provided the patient escape amputation in these cases, he will not be likely to recover without permanent anchylosis and comparative uselessness of the hand.

§ 2.—FRACTURES OF THE METACARPUS.

The metacarpal bones may be broken by direct violence, or by counter-stroke, as for example, in striking against a resisting body with the clenched hand. The accident is liable to occur in any of these bones, but is most frequently met with in the metacarpal bones of the thumb and those of the ring and little finger.

The *symptoms* are such as to render the nature of the injury apparent, there being more or less marked deformity on the posterior surface of the hand, in consequence of the outward projection of the anterior fragment. Crepitation is elicited by pressing the extremity of the fragments together, while there is also considerable swelling, with pain.

Treatment.—Provided the fracture occurs in the metacarpal bone of the thumb, it may be dressed with three splints, two of which should extend from the wrist to the extremity of the thumb, while the third, placed on the outside of the bone, should be only the length of the thumb. They are to be retained by the ordinary spiral bandage.

If the fracture occurs in any of the other metacarpal bones, the deformity may be reduced by making extension upon the corresponding finger, at the same time pressing firmly upon the displaced fragments. A felt or thick pasteboard splint is now to be accurately moulded to the palm or back of the hand, and held in position by a few turns of the roller, the fingers being slightly flexed. In case the metacarpal bone of the index or little finger is broken, care is to be taken to have the splints sufficiently wide

to prevent the roller from pressing upon the sides of the hand. A ball of twine grasped within the hand and the fingers bound over it by means of a roller, has been recommended for fractures of the metacarpal bones. For fracture of the lateral metacarpal bones, a flat, wooden splint may be used as a support, cut to fit the hand and fingers.

Place the forearm in a sling, observing the necessary precaution of examining the parts frequently. Should the inflammatory action run high, it is to be combatted on the general principles already given. Passive motion is to be practiced as early as expedient in order to prevent anchylosis.

In *compound fractures* involving these bones, every effort should be made to save the part, and if removal becomes necessary, it should be done to as limited an extent as possible.

§ 8.—FRACTURES OF THE PHALANGES.

In consequence of the slight protection afforded by the muscles and tendons, the fingers are particularly liable, when fractured, to be attended by more or less serious complications. Owing to their extreme mobility, however, they are not so frequently the seat of fracture as is generally supposed.

The *symptoms* are so obvious as not to require enumeration.

Treatment.—Coaptation of the fragments having been effected by pressure and counter-pressure, retention is secured by means of splints, either of thin pieces of wood or binders' board, long enough to extend from the middle of the forearm to the ends of the fingers, the hollow of the palm being well padded, and the forearm supported in a sling. In the treatment of all fractures of the upper extremity, the limb (unless bound to the chest) should be supported in a sling, which may, within reasonable limits, be lengthened or shortened according to the patient's fancy or preference.

SECTION V.

FRACTURES OF THE FEMUR.

The femur, in consequence of its peculiar formation, structure, exposed situation, and powerful muscular attachments, is exceed-

ingly liable to various forms of fracture: each of which demands the closest attention, owing to the important functions performed by this bone and the difficulty experienced in preventing deformity.

It may be broken in any portion of its extent, while each variety gives rise to a special deformity, and hence, for the purpose of convenience of study, the subject will be considered as, fractures of the neck of the femur, both within and without the capsular ligament; of the great trochanter; of the shaft, and of the condyles.

Prof. Bigelow does not give much practical significance to the terms *intra* and *extra* capsular fractures on account of the varied attachment of the capsule in different persons, and the utter impossibility during life of determining precisely whether the fracture is inside or outside of the capsular ligament. He therefore divides these injuries into the *impacted* and *non-impacted* fractures. I shall, however, retain as far as possible the old classification in my description of these accidents as being more familiar than the preceding and less liable to confusion.

§ 1.—FRACTURE OF THE NECK OF THE FEMUR WITHIN THE CAPSULE.

(INTRA-CAPSULAR.)

This accident is almost peculiar to old age, and occurs more frequently in women than in men, and is owing indirectly to the changes in the structure, shape and position of the head and neck of the femur with advancing years. The cancellous structure of these parts becomes expanded, the cells enlarged, loose and loaded with fat. The neck instead of being oblique, becomes horizontal and inserted nearly at right angles with the shaft; besides these there is that brittleness of the osseous structure peculiar to old age. The fracture may occur within or without the capsular ligament extending in an oblique direction, or inclining more or less to a perpendicular form within the capsule down the shaft of the bone. The capsule may remain uninjured, but the prolongation of it which invests the neck of the bone, is usually torn through. As the violence producing this fracture is generally slight, and the vascularity of this portion of the bone in advanced age inconsiderable, it follows that there exists but little extrava-

sation of blood from this injury. The fragments are almost always so separated that the fractured surfaces are not in apposition; the upper end of the lower fragment is drawn above and to the outer side of the head of the bone, and at the same time is twisted so that its bent surface looks forward. The head remains in the acetabulum, attached by the ligamentum teres, and sometimes preserving a connection with the lower fragment through the medium of some untorn portions of the fibrous membrane investing the neck, the capsule being uninjured.

Causes.—The causes of this variety of fracture are usually very slight, indeed it may be viewed as a special injury of advanced life, being seldom met with under fifty. Sir Astley Cooper states that of two hundred and fifty-one cases of intra-capsular fracture, only two happened in persons below this age. Mr. Stanley, of London, however, reports an accident of this kind which happened to a lady of eighteen years of age. It is generally the result of some trivial accident, as a fall upon the great trochanter; by the great toe catching in the fold of the carpet while walking; by the sudden slipping of the foot off the edge of the sidewalk, or stepping from a carriage; by turning awkwardly in bed, or stepping from the bed upon the floor in a manner to twist the limb more than usual.

Symptoms.—The symptoms of intra-capsular fracture are—1st, shortening of the thigh; 2nd, eversion of the foot; 3rd, preternatural mobility; 4th, crepitus; 5th, change of position in the trochanter-major; 6th, pain at the site of injury; 7th, peculiarity of the patient's body in the erect position.

1st. *Shortening of the Thigh.*—The *shortening* in cases of fracture within the capsule seldom exceeds, in the first instance, half an inch to an inch, but from the subsequent yielding of the capsule of the joint a greater separation is permitted between the fragments which may amount to two, or two and a half inches. In some cases this shortening takes place suddenly during an attempt to use the limb, and is accounted for by the entire giving way of the cervical ligament which, previous to this time, was not completely ruptured, or, it may be owing to the complete separation of the fragments of bone that were previously interlocked. At other times it is *gradual*, and several weeks or even months

pass away before the limb is shortened to the fullest extent spoken of: and this variety of shortening is due to interstitial absorption of the neck of the femur. The time at which shortening occurs varies. Sometimes it is very slight at the first, and only becomes decided after the lapse of a few days, and may be gradual or sudden according to the operation of the causes mentioned. The constitutional disturbance in old people suffering from this injury is often considerable, and frequently terminates fatally by the supervention of congestive pneumonia, an asthenic state of the system, or sloughing of the nates from long confinement in bed during treatment. The injury may be justly considered as dangerous and not infrequently of a fatal character.

2nd. *Eversion of the Foot*, is an almost invariable accompaniment of intra-capsular fracture, and is more marked in those cases in which the shortening is most considerable. This eversion has been attributed by some authors to the action of the rotatory muscles, and others to the "natural attitude into which the limb falls when left to itself." In a few cases of this variety of fracture, *inversion* of the foot has been noticed, and its cause has been largely discussed and variously attributed; by some to the cervical ligament not having been torn through at its inner side; by others to paralysis of the rotatory muscles, which I am most inclined to accept.

3rd. *Preternatural mobility.*—This is an important diagnostic sign of intra-capsular fracture, except in those cases where impaction of the fractured ends of the bone has occurred, or the ends of the bones are held in apposition by interlocking of their roughened fragments, or, from incompleteness of the solution of continuity. Its extent may be ascertained by taking hold of the limb and rotating it upon its axis, flexing it upon the pelvis, carrying it behind the line of the sound limb, or inward and outward, which movements cannot be performed where there is dislocation of the head of the femur. The limb may be restored to its natural length by extension and counter-extension, but shortens again as soon as these forces have been taken off.

4th. *Crepitation.*—This is common to all fractures—one of the most important diagnostic accompaniments, is very rarely absent in intra-capsular fractures, and only so in those cases where

impaction of the fragments occur, or where the ends of the bony fragments remain more or less in apposition. It may be detected at once after the occurrence of the fracture, and will continue discoverable until consolidation or union of the parts takes place. It may be produced at will by rotation of the limb with extension and counter-extension, the ends of the broken bone being rubbed one against the other.

5th. *Change of position in the trochanter-major.*—The change of position of the great trochanter is a symptom of importance in this variety of fractnre. This bony protuberance is not only drawn upward toward the ilium, but is brought in close contact with the border of the acetabulum, and consequently is much less easily seen and felt than in the natural condition of the parts, in which latter it is usually so conspicuous. The great trochanter will be found to turn, as it were, upon a pivot, or to move in a segment of a circle of less diameter than natural.

6th. *Pain at the site of injury.*—Pain, common to all fractures, is of interest in this injury only in connection with other symptoms. It is located at the upper and inner part of the thigh, in the direction of the trochanter-minor and is greatly increased whenever attempts are made to rotate the limb, to bend it upon the pelvis, or to carry it inward over the sound one. When the patient is very quiet, the suffering is generally of a trifling character with the limb placed in a relaxed position. If the bone has sustained a severe concussion along with the fracture, the pain is very intense and worse at night.

7th. *Peculiarity of position.*—In the standing position, the heel of the fractured limb is directed toward the hollow between the ankle and tendo-achilles of the sound limb. When lying down, the foot drops outward almost horizontally, inclining nearly to a level, and in contact with the surface of the couch upon which the patient is lying.

Differential Diagnosis between fracture and luxation.—As mistakes may occur in determining between fracture of the neck of the femur and other injuries in this situation, I will present a table of differential symptoms as a guide to the young practitioner, thus enabling him to form correct conceptions of the real nature of the injury. Sprains and dislocations of the hip joint are apt

to be confounded with fracture, and fracture within the capsule may be mistaken for one without it.

Sprains and contusions of the hip, causing involuntary obliquity of the pelvis, with apparent shortening of the limb and eversion of the knee and foot, accompanied with great pain and difficulty of motion, sometimes so closely simulate the symptoms of intra-capsular fracture, as to cause great doubt and uncertainty in the surgeon's mind as to the real nature of the injury.

In fracture, the shortening is *real*, and can only be overcome by extension and counter-extension.	In sprains and contusions, the shortening is *apparent*, as may be proved by placing the iliac crests on the same level and bringing the limbs parallel with each other.
In fracture, eversion of the foot is complete, and the limb presents the appearance characteristic of total loss of power, the thigh cannot be extended, flexed, or rotated.	In sprains, eversion, if it exists at all, is very slight, and can be rectified by the patient's own effort, although productive of considerable pain.
In fracture, the power of motion is absolutely lost.	In sprains, the power of motion is diminished but not lost.

Differential Diagnosis between Intra- and Extra-Capsular Fracture.

Intra-capsular fracture occurs nearly always in old persons, and is generally produced by slight causes, as mis-steps, &c.	Extra-capsular fracture, requires a greater degree of force and is usually the result of a fall upon the great trochanter.
Intra-capsular fracture generally occurs in persons over fifty years of age.	Extra-capsular fracture more often occurs under this period of life.
Intra-capsular fracture occurs more frequently in females.	Extra-capsular fracture more often in males.
In intra-capsular fracture the pain and swelling is inconsiderable and when it occurs is deep-seated.	In the extra-capsular fracture the pain, tenderness and swelling are great, but superficial—pressure around and upon the great trochanter is exceedingly painful.

In intra-capsular fracture, measurement at first shows little if any shortening.	In extra-capsular fracture, measurement gives the shortening from the first.
In intra-capsular fracture, shortening greatly increases with time, but sometimes takes place suddenly from movement of the limb or stepping upon it.	In extra-capsular fracture, the shortening increases but little, if at all, from the first, and if impaction has occurred it remains stationary, but is always less than in the intra-capsular.
Intra-capsular fracture has more mobility in the limb than the extra-capsular.	Extra-capsular fracture has crepitus more distinct, and ringing than the intra-capsular.
Intra-capsular fracture has function much impaired but not wholly abolished.	Extra-capsular fracture has the loss of power complete, the limb lying as if paralyzed.
In intra-capsular fracture the trochanter-major moves upon a longer radius of a circle, as upon a pivot, and the swelling is generally unimportant.	The extra-capsular moves upon a shorter radius of a circle, and the swelling denotes that greater violence has been inflicted upon the parts.

The general distinctive features between dislocation and fracture of the head and neck of the femur, may be briefly alluded to in this connection as follows:

In dislocation the limb is fixed, while in fracture its mobility is increased; in dislocation reduction is difficult, in fracture, easy; when reduced, in dislocation, the limb preserves its natural position, in fracture its recurrence is immediate upon cessation of extension and counter-extension. The absence of crepitation in dislocation, and shortening being also more decided than in fracture. The position of the head of the bone, which rotates with the shaft in dislocation; the age of the patient at the time of the accident; the violence of the injury producing dislocation, as compared with the slight causes effecting fracture, are sufficient, under ordinary circumstances, to determine the existence of the one or the other of these injuries.

Treatment.—The treatment of intra-capsular fracture depends almost entirely upon the constitutional integrity of the patient, and the views entertained by the surgeon in reference to the

mode of union. In some cases no union occurs, the head of the bone remaining in the acetabulum, which is hollowed into a hard, smooth, cup-shaped cavity, into which the polished and rounded neck is received and plays as in a socket. If the patient is very old and feeble, Sir Astley Cooper advises not to sacrifice the little remnant of health and strength left, and run the risk of producing bed sores and the accompanying constitutional disturbances that ensue from this state in the hope of procuring bony union; under these circumstances, lengthened confinement in bed most commonly proves fatal. The plan he suggests is to keep the patient in bed for two or three weeks, until the limb has become less painful, the knee being well supported upon pillows or the limb placed in a suitable splint. After this time a leather splint should be fitted to the hip, and the patient be permitted to walk about on crutches. In time, a tolerable use of the limb will be regained, but the lameness will continue during the remainder of life.

If, on the other hand, the patient is not very aged, and possesses a sound constitution, especially when there is little separation of the fragments, with trifling shortening and indistinct crepitus, an attempt may be made to procure osseous union. This may be effected by the application of the long thigh splint, or, if this cannot be borne, by the double inclined plane, with a padded belt strapped about the hips. This may be worn for two or three months, when a leather splint may be substituted and the patient put on crutches. As the limb improves in strength, a high heel shoe must be worn, and a cane substituted for the crutches.

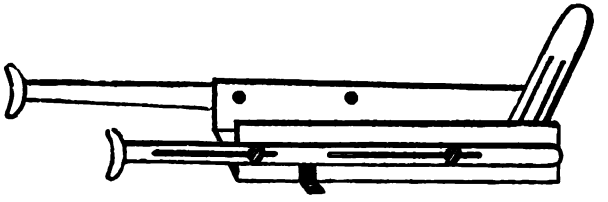
The treatment recently advocated by Dr. H. G. Davis,* in which he advises permanent extension and counter-extension after partial union has been effected seems more worthy of the confidence of the profession, than the let-alone treatment of Sir Astley Cooper, who taught that there is no osseous union in this variety of injury, and therefore it is highly improper to torture the patient with long confinement in bed, and the application of the extending apparatus. Recent observations, however, teach us

* Conservative or Mechanical Surgery.

that these fractures do sometimes get well if properly treated, with little or no deformity, especially in persons of sound constitution and bodily vigor, whose systems have not been broken down by intemperance or excesses of any kind, and who can bear the requisite confinement necessary in such injuries to establish union. Dr. Davis recommends as soon as the patient reaches his home, that adhesive straps be applied, and extension of the limb made by means of a weight of sufficient bulk to bring the limb down to its full length in a few hours. For the first few hours, four to six pounds, and then gradually increased to eight or twelve pounds will generally suffice. The limb requires to be watched to maintain it at its original length and in proper position. The extension and counter-extension will be applied on the same general principles laid down in fractures of the shaft of the femur, to be spoken of hereafter.

An apparatus highly recommended by Prof. Gross, in the treatment of intra-capsular fracture is his fracture box, as show in Fig. 322; or instead of this, the limb may be placed in an easy

Fig. 322.



position over a double inclined plane, and maintained in the extended position with the hope, if not of obtaining bony union, at least of keeping the ends of the fragments in apposition, thus affording them an opportunity of becoming united by fibro-ligamentous tissue.

The apparatus so highly recommended by Dr. Davis in the treatment of Coxalgia, vol. 2, p. 97, has effected most excellent results in many cases, and should only be applied after partial union has been effected by the treatment recommended by Prof. Gross, or the weight and extension of Prof. Buck, which will be referred to hereafter while treating of fractures of the shaft of the femur. The splint and apparatus of Davis should be applied

upon the same principles laid down under the head of Coxalgia, and the patient be permitted after application to move about on crutches. Whatever plan of treatment be adopted, its effects should be carefully watched and all injurious consequences avoided. *Symphytum* should be employed internally and great benefit will accrue to the patient in its use. The diet should be liberal, with a generous allowance of meat—in fact, everything should be done to bring about as perfect a state of health as is possible.

§ 2.—FRACTURE OF THE NECK OF THE FEMUR WITHOUT THE CAPSULE.

(EXTRA-CAPSULAR.)

The extra-capsular fracture is situated at the base of the neck of the femur and may be of two kinds, the *simple* and the *impacted*. In both cases the fracture is usually found to be at or just outside the insertion of the capsule of the joint. The trochanters are usually splintered and sometimes entirely detached. The fracture may be further comminuted by the penetration of the superior piece into the inferior. This fracture is less frequently met with than the intra-capsular, and may take place at any period of life; but according to Erichsen, is most frequent between the ages of thirty and forty, while Gross says that it is seldom met with in persons under fifty years of age, and is most frequent after the sixtieth year. It is usually caused by the application of direct violence to the hip, still some cases occur from very slight causes, owing, no doubt, to the brittle condition of the bone which is known to exist among the aged.

Symptoms.—The symptoms of this fracture bear a marked resemblance to those which have been described as existing in intra-capsular fracture. The hip will be found much swollen from extravasation of blood; crepitation is loud and distinct and readily perceived upon rotating the limb, and in some cases the separate fragments may be felt. The limb is generally everted, and lies in any position in which it may be placed, the patient having lost all power to control its movements. Eversion is not always present; inversion occurring more frequently in this than in intra-capsular fracture. The shortening which is always pres-

ent usually varies from half an inch to an inch and a half, and in severe cases where the lower fragment overlaps the upper, it may amount to two, and sometimes even four inches ; unlike intra-capsular fracture, shortening is usually as great *immediately after the injury* as at any subsequent period. The pain is generally very severe, and increased by every attempt at motion. In addition to the above there will usually be a high degree of fever which often lasts a number of days.

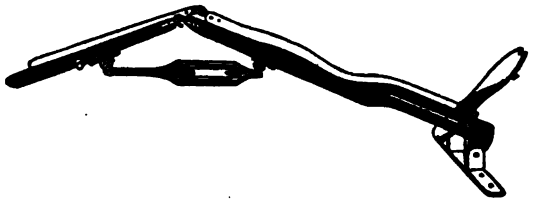
Diagnosis.—The principal things to be considered in forming a diagnosis are, the external signs of injnry ; in extra-capsular fracture the parts are usually much bruised and discolored, " the fracture being caused by direct and severe injury," the shortening is usually slight and is as great immediately after the injury as at any subsequent time. The pain is generally very severe, and greatly aggravated by moving the limb. The loss of power is complete ; crepitation is loud and distinct, and easily perceived by placing the hand upon the seat of injury while rotating the limb. In intra-capsular fracture, the external signs of injury are slight, " the fracture being caused by slight and indirect injury." The shortening is slight at first but gradually increases. The crepitation is indistinct and the loss of power is incomplete. The age and sex of the patient are of little diagnostic value. Compare differential diagnosis of intra- and extra-capsular fracture, pages 440–41.

Prognosis.—The prognosis should be guarded, as deformity, lameness, and sometimes death will ensue in spite of our best efforts. If the fracture is comminuted the most judicious management will usually fail in securing a good result, the large, bony callus that is necessary to unite the fragments, proving a serious impediment to the motion of the joint. On account of the extensive injury inflicted upon the soft parts, death may result from pain, irritation, and shock to the system, or from extensive suppuration and sloughing of the parts. There is also considerable danger from the supervention of erysipelas or pyemia —the former appearing soon after the occurrence of the fracture and the latter towards the end of the first week.

Treatment.—The indications in the treatment of extra-capsular fracture are to overcome the deformity, restore the parts to

their natural position and keep them at rest. The means generally employed to carry out these indications, are the apparatus already described for intra-capsular fracture as Davis's apparatus, the common double inclined plane, or the apparatus known as

Fig. 322, A.



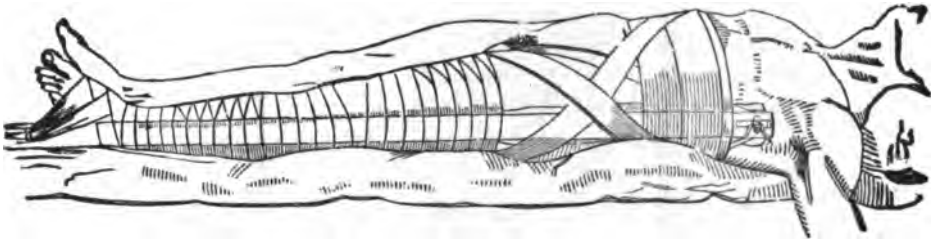
A side view of McIntyre's Splint as formed into a double inclined plane by the action of the screw beneath the knee.

McIntyre's Splint, Fig. 322, A, which is of sheet-iron, moulded to fit the limb, and so constructed that by means of screws it may be lengthened or shortened, to be adjusted nicely to the limb, and at the same time placed at any angle desired. The splint being well padded the limb is placed upon it; the foot firmly secured to the foot-board. The leg being then bound to the splint by means of a single-headed roller, extension is made from the bend of the knee, counter-extension being kept up by the weight of the body. The whole limb is then secured to the splint. This splint being lighter and neater, is preferable to the common double inclined plane made of wood.

Another mode, and one to which Prof. Gross and others give the preference in treating this fracture, is by means of the long straight splint known as Liston's splint. It consists of a long splint, reaching from the axilla to about six inches below the foot, a circular opening being made opposite the external malleolus. Two openings are made near the upper extremity to receive the perineal bandage, and two notches cut in the lower extremity to receive the roller used in making the extension. The splint being well padded, is now applied to the outer side of the limb; a smooth bandage is passed around the perineum and secured to the splint by passing the ends through the two open rings in its upper extremity. The extension is now made by passing a bandage or roller around the foot and through the notches in the lower extremity of the splint; counter-extension being kept up by

means of the perineal bandage. The limb is now secured to the splint by means of the roller, thus bringing the parts into their natural position and securing perfect rest. See Fig. 323.

Fig. 323.



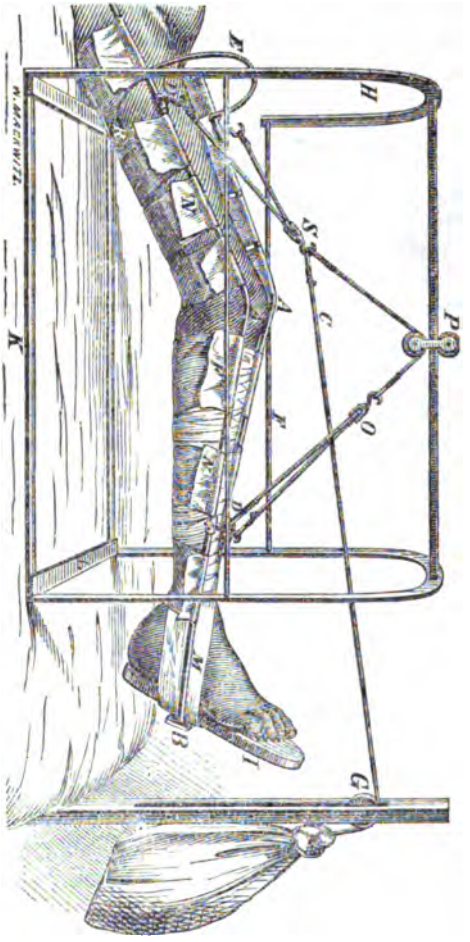
A view of Liston's Splint as applied in fracture near the trochanter, or any other portion of the shaft of the femur. (After Liston.)

Prof. E. A. Clark's Suspension Splint.—In the use of this splint, and its adaptation to the successful treatment of fractures of the femur, the late Prof. Clark says:

"After some experience in the use of a splint, combining the principles of Prof. Smith's double inclined plane and the method of suspension shown in connection with his anterior splint, and realizing the inconveniences and defects above referred to, I devised an improvement in the method of suspension and extension which entirely obviates these disadvantages.

This apparatus, as represented in the accompanying cut, Fig. 323, A, needs but little description to indicate the manner of its application. The arch and pulleys upon which the limb is suspended are exactly the same as those of my splint for treating fracture of the leg, as hereafter described. The arch should be made of iron bars one-eighth of an inch in thickness and half an inch in width. The top of the arch (H) should stand eighteen inches from the surface of the bed; the width of the frame at the bottom (L) should be fifteen inches, and its length (K), twenty-four inches. The two arches are braced upon each other by the slender bars (F F), at either side, and the rail at the top upon which the pulley (P) glides. This rail, to prevent bending, should be made of steel, three-eighths of an inch in width and one-fourth of an inch in thickness, with its broad diameter placed in the vertical position, and should have a thumb-screw at one end, so that it may be withdrawn to apply the pulley. It will be

Fig. 823. A.



observed that the arch at the proximal end is cut away at the inner side, immediately below where it joins the lateral bar (F), the object of which is, to allow the patient to use the other limb more freely. The frame or splint upon which the limb is mounted —like that of Smith's double inclined plane,—consists of iron rods (A A), one-fourth of an inch in thickness, placed parallel on both sides of the limb, extending its whole length and transversely across below the foot. The limb is then adjusted in the splint by placing it in position and pinning strips of band-

age (N N) four or five inches in width over the bars on either side, constituting the floor of the splint, upon which the limb is allowed to rest in the suspended position, instead of the tin trough on the thigh part of Smith's splint, but similar to the strips pinned across the leg portion, and probably first used by German surgeons. To this is added, however, as will be seen in the diagram at (R), a sheet of heavy pasteboard five inches in width, extending from the nates to the knee, upon the posterior surface of the thigh, thus giving a more equable support to the limb at the point of fracture. These bars, upon which the limb is supported, are prevented from approaching too near to each other or to the limb, by the wire bow (E), holding them in position at their upper extremities.

The attachment for extension is by means of adhesive strips (M), extending from near the knee and passing around the foot-piece (1), to which is attached a small bracket (B), which hooks over the lower end of the splint. Then the limb is suspended by the four hooks (D D), which are attached to thimbles that slide back and forth upon the bars, and are fixed at the desired point by means of thumb-screws in their outer sides. The limb now being suspended, the extension is made by means of the cord (C), attached to the hook in the pulley at (S), which passes forward between the cords playing over the pulley at (O), and is carried over the pulley (G), fixed in the slender post at the foot of the bed, and then attached to a sand-bag of sufficient weight to make the necessary amount of extension. The weight ordinarily required for an adult is from ten to fifteen pounds. With the limb thus adjusted in the apparatus the axis of the femur may be changed to any line that may be desired by sliding the thimbles nearest the foot forward or back, which will elevate or depress the leg, and in doing so will produce just the opposite effect in the position of the thigh. Or again, the same can be accomplished by sliding the thimbles at the thigh back or forward. Or, the axis of the femur may be still more conveniently adjusted by sliding the pulley (P), back or forth upon the suspension rail. The pulley being drawn toward the body, will have the effect of elevating the thigh and depressing the foot, and *vice versa*. Then by means of the lateral movement afforded by

the pulleys (S, O), the patient is enabled to rotate the limb sufficiently to allow him to lie upon his side, if it becomes necessary, without producing any displacement.

The only counter-extension required with this dressing is the weight of the body, which is quite sufficient in all cases; for even though the patient should gradually slip down in bed, the extension is constantly the same until his foot reaches the post at the foot of the bed, when, without any assistance, he can draw himself up in bed again, the whole apparatus connected with the limb coming back with the pulley (P) upon the suspension rail, when the body is drawn upward. While, again, by placing the frame at such a distance from the foot of the bed that the patient's foot cannot reach the post sustaining the pulley (G), it is impossible that the permanent extension shall be at all interrupted or changed by any movement or change of position the patient may make.

Thus is will be seen that the patient is enabled to execute many movements of which the sound limb is capable, without in any way modifying the force of the extension, or changing the axis of the femur. Even though the patient desires to sit up, or lie upon his side, as he is often compelled to do because of bed-sores, or other injuries upon his back, or for the evacuation of his bowels, the position of the fracture is not in the least affected or union retarded.

It has been urged, and may be thought by some, as an objection to this plan of treating fractures of the femur by suspension, that the great degree of motion allowed to the limb, will admit of too much mobility in the fracture. But such objections are altogether theoretical, for it must be apparent, as experience has proven, that with any ordinary movement of the limb, the motion will take place where there is the least resistance, which would of course be at the joint, and not at the point of fracture. It will readily be seen that as the weight of the limb is supported as much upon the upper as upon the lower fragment, and the entire limb carried alike in every movement, the whole length of the thigh being supported upon the sheet of pasteboard on the floor of the splint, it is impossible for any motion to take place at the point of fracture without direct force being exerted for this pur-

pose. This apparatus is also peculiarly adapted to compound fractures of the femur, as the limb, not being encumbered by bandages or splints, is always exposed to view, and the necessary dressings can be conveniently applied without at all interfering with the apposition of the fragments ; and the strips of bandage beneath, upon which the limb is supported, can be readily removed when they become soiled, and replaced with fresh ones, without in the least disturbing the position of the limb.

I have during the past three years, treated a large number of fractures with this apparatus, with better results, and less discomfort to the patient, than I have secured from any other appliance. Of these, one patient was a delicate female sixty years of age, with an extra-capsular fracture of the neck of the femur, with a contusion upon her back, that required her to lie upon her side most of the time during the ten weeks her limb was kept suspended. In another case—that of a man fifty-six years of age, with a fracture at the middle third of the femur, which from unnecessary interference was prevented from uniting,—at the end of fourteen weeks (now eight weeks since), I performed the usual operation for ununited fractures, by lacerating the fractured surface with a gorget, and readjusted the limb upon the apparatus as before, and the fracture is now becoming quite firm and will soon be a successful cure, without any deformity or shortening of the limb. I feel confident that a single impartial trial of this apparatus, will satisfy any one as to its practical utility, and that no other apparatus has yet been devised, so fully to obviate the many inconveniences attending the treatment of the class of injuries for which this is especially adapted."

The treatment of extra-capsular fracture is in all respects similar to that which is necessary in fracture of the shaft of the femur. The limb should be placed in the flexed or straight position, and be kept perfectly at rest with whatever variety of splint answers the purpose best, and be maintained in such position by extension and counter-extension until partial union or a cure be effected. The foot should *incline slightly* outward, to favor relaxation of the rotator muscles, and especial care should be taken to prevent angular deformity, or the fragments overlapping each other, by well-adjusted splints moulded to the external or internal aspect of the thigh.

For my own part, I have of late years preferred Hodgen's splint as the best adapted to the treatment of this fracture, as well as all other fractures of the shaft of the femur, and believe that in its use, as good results will be attained as by any other method.

§ 8.—IMPACTED FRACTURE OF THE NECK.

This fracture has especial reference to those cases where the upper fragment of the bone is driven into the cancellous structure of the lower one, and remains fixed in that position. According to Prof. Gross, old people only are subject to it. It usually happens from a severe blow upon the hip, the body being crushed by a heavy weight, while the chest is inclined forward, the knees resting on a solid surface; or it may occur from a fall upon the knee, the body at the same time being impelled in the opposite direction. The line of fracture is generally oblique from the great to the small trochanter, and frequently both are included in the injury.

Symptoms.—There is always eversion of the foot though not generally so great as in the fracture without impaction. The thigh is shortened from a few lines to an inch or more. Crepitation is absent. The patient is able to bear his weight upon the limb, and often is competent to walk after the accident, though with much suffering; all ordinary attempts to restore the limb to its normal *length* by extension and counter-extension fail, the fragments retaining their unnatural position. There is usually intense pain, excessive swelling, and discoloration of the soft parts. The limb, however, can be extended, adducted or abducted and even rotated upon its axis. Considerable deformity exists in the region of the great trochanter.

Prognosis.—The prognosis is usually favorable, the fragments being so firmly wedged together that but little callus is required to effect their consolidation. Some lameness and deformity may remain even under the most favorable circumstances, due to shortening of the limb and incurvation of the thigh just below the hip.

Treatment.—Whenever impaction is suspected no attempts should be made to pull the ends of the bones asunder, but the limb should be placed in an easy position in bed, a pillow lying under the ham, gentle and steady pressure made in the direction

of the great trochanter by means of a compress and bandage, in order to correct any deformity that may exist. If inflammation exists it should be combatted by the remedies heretofore spoken of. *Symphytum* should be given internally and employed externally, and other agents administered as required by the conditions of each case.

§ 4.—FRACTURE OF THE GREAT TROCHANTER

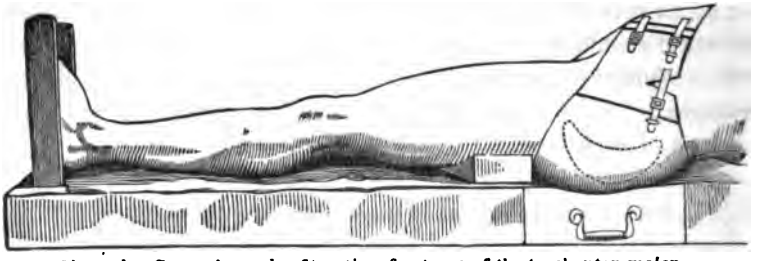
May take place independently or in connection with fracture of the neck of the femur. It may occur at any period of life, but is more frequent after middle age, and is usually the result of direct violence. The trochanter is sometimes broken into a number of fragments, the pieces grating under the fingers like fragments of broken china. Still, such instances are rare.

Symptoms.—There is usually some eversion of the foot, the limb lying in a helpless condition, the patient being unable to change his position. There is great difficulty in obtaining crepitation on account of the separation of the fragments. There is more or less contusion and discoloration with severe pain whenever the patient attempts to sit down, a position which he is unable to assume.

Prognosis.—Unless the bone is comminuted, union by osseous matter may be reasonably expected without deformity of the hip, or impairment of the functions of the limb. The only difficulty usually experienced is in keeping the broken parts in apposition, to effect which requires the utmost vigilance on the part of the surgeon.

Treatment.—The principal indication is to maintain the limb in a state of perfect rest. This is best accomplished by means of two long splints, the foot, at the same time, being supported in a perpendicular direction with a slight tendency to eversion, as is natural in such a position, the trochanter is then drawn into its normal position and confined there by means of a broad, soft leather belt extending around the pelvis. The belt should be furnished with a hollow pad to assist in embracing the prominence of the hip. The apparatus necessary for this fracture is well shown in the accompanying Fig. 324.

Fig. 334.



Sir Astley Cooper's mode of treating fractures of the trochanter-major.

Compound fractures of the neck of the femur rarely happen, except from the use of firearms, and when occurring, require surgical interference, either amputation or resection, according to the extent and nature of the injury.*

§ 5.—FRACTURE OF THE SHAFT.

Fracture of the femur is of common occurrence, and may happen at any period of life, but is most frequently found among the middle-aged. It is usually produced by mechanical violence, such as a blow, or fall upon the part. It may sometimes, though very rarely, be the result of muscular action. They are generally oblique (except in children, when they are commonly transverse), and occur at the middle, upper and lower third of the femur, their relative frequency being in the order named.

Symptoms.—The symptoms are usually well marked, and consist of shortening of the limb from two to four inches, with eversion of the foot. Crepitation is usually distinct. There is inability to move the limb. The amount of deformity varies in extent according to the seat of the injury. There is considerable swelling and intense pain whenever any motion of the limb is attempted, with angular deformity, the lower fragment being drawn to the inner side of the upper one and rotated outward.

Prognosis.—In all fractures of this bone we should be very careful how we promise our patients a *perfect cure*, for experience teaches us that such a thing is rarely accomplished. Even in those cases which are treated with the greatest care there will usually be found some shortening of the limb; this may be slight,

*See Gunshot Wounds, vol. 1, p. 718.

from half to three-quarters of an inch being the general average. In persons under fifteen we may perhaps be more successful in obtaining a perfect cure. The duration of treatment usually varies from six to twelve weeks, according to the age of the patient.

Treatment.—In treating fractures of the shaft of the femur, various plans have been proposed by different authors, each differing in detail, but all agreeing that extension and counter-extension is the safest and most effectual method. Whether the limb shall be maintained in the straight or in the semi-flexed position, is still a disputed point: a large proportion of American practitioners preferring the former plan, while many European surgeons as tenaciously hold to the latter. I am free to confess that while I regard the straight position equally as beneficial as the other, I have adopted almost uniformly the semi-flexed, hence my observations and deductions have been made with especial reference to this position, and not from a comparative stand-point.

Whatever differences may present themselves in the nature and character of the apparatus employed, most writers are agreed as to the necessity of enforcing the following regulations:

1st. The ends of the broken bones are to be steadily maintained on a line with each other.

2nd. Care must be exercised that no *shortening* occurs.

3rd. The limb should be maintained in a *slightly* everted condition, it being the most natural position when the body is dorsally recumbent.

4th. Sloughing of the heel must be prevented, and also fretting and galling of all parts exposed to the action of bandages or dressings.

To accomplish these purposes various plans have been proposed, all tending to produce the same desirable results, viz: restoration of the limb to a position as nearly as possible normal, and to prevent any and all injurious consequences that are prone to occur during treatment.

Mr. Pott, of England, advocated the plan of laying the patient on the affected side, the thigh at right angles to the trunk and the knee bent in a semi-flexed position and supported upon smooth pillows; with a many-tailed bandage and two broad splints applied

between the pelvis and knee. This plan was recommended by this distinguished surgeon upon the principle that the position would relax the different sets of muscles connected with the broken bone and prevent them from acting injuriously upon its fragments. The disadvantages of the mode, however, which consists in the patient's inability to remain the required time in one position, and the supervention of sloughing of the prominent points pressed upon, militate against its success in a practical point of view.

A *second* plan of treatment consists in maintaining the limb in position by the double inclined plane, and it cannot be denied, says Prof. Gross, "that very excellent cures are occasionally effected with it." It is more frequently employed in this country than formerly in simple fractures of the shaft, and is recommended as more especially adapted to fracture at the upper portion of the thigh involving the neck and condyles, where there exists a constant disposition to displacement of the lower extremity of the upper fragment. The extension by this process is made mainly by the weight of the leg and foot, the counter-extension being kept up by the weight of the body and the pressure made by the instrument against the tuberosity of the ischium. In *compound fractures*, attended with severe bruising and laceration of the soft parts, when long confinement in the extended position would be productive of great pain and extreme discomfort, it has been advantageously employed. The apparatus most frequently used in this country is McIntyre's Splint, or double inclined plane, as modified by Liston.

The *third*, and what seems to the author to be the most frequently used as compared with other methods of treatment, is extension in the straight position. Here, as in extension by the double inclined plane, numerous contrivances have been devised, all possessing more or less merit, and all having in different degrees of perfection those great and fundamental principles which are necessary in order to be the better adapted to meet the requirements for which they were invented. In this as in all fractures, the more simple the apparatus, the more readily it is applied and the more efficient it becomes. With mechanical skill, tact, and knowledge of the anatomy of the parts concerned, almost every practitioner will be enabled to adopt the requisite means necessary in each case to effect a successful result.

Before proceeding to reduce a fractured thigh, the surgeon should see that a proper bed is prepared for the reception of the patient, as it is utterly impossible to treat fractures of the femur without a suitable bed. The requisites for such a bed should be a hard and firm mattress, upon wide cross slats, and an arrangement by which the patient may evacuate the bowels without being compelled to rise. These requisites are combined in the ingenious contrivances of Drs. Coates, Hewson and Daniels, and in large cities and among the wealthier classes may be employed with great advantage to the patient and satisfaction to the medical attendant.

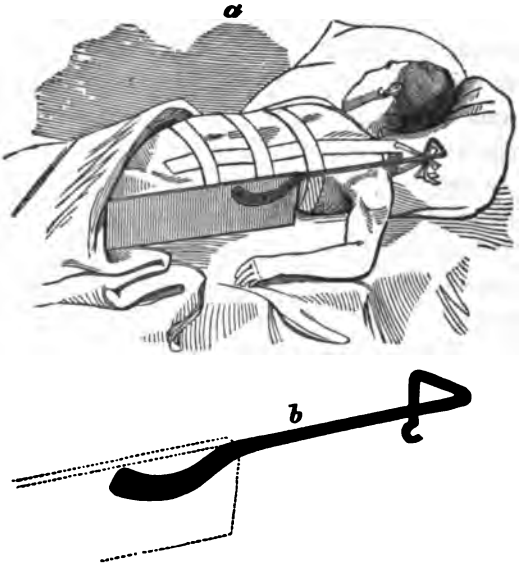
The bed being prepared, the next thing is to determine the kind of apparatus to be employed in the treatment of this fracture.

The apparatus most commonly used in this country is that of Dessault as improved by Dr. Physick. It consists of the long splint previously described in extra-capsular fracture (Fig. 328), extending from below the sole of the foot to the axilla, and a short one extending from the same point to the perineum. These are connected below by a transverse bar for receiving the extending bands. The patient lying upon his back upon a firm bed, the extension and counter-extension straps are applied as before directed. The long splint, well padded, is then applied to the outer side of the limb. The counter-extending straps are then passed through the holes in the upper end of the splint, and the extension strips secured to the transverse bar below. The inner splint well padded is now applied to the inner side of the limb and secured by three strips of roller passed entirely around the whole; extension is now made upon the limb until it is restored to its proper length, when the whole is firmly secured. A hoop should now be placed over the toes to keep off the weight of the bed-clothes. If there is still some shortening of the limb, further extension should be made in two or three days and the bands tightened. In this and all cases wherever any change is made in the apparatus, extension and counter-extension must be carefully maintained by the hands of assistants until the splints are reapplied, and all motion of the fragments must be avoided.

Hodge's Splint.—A valuable addition to the long splint, and which is an improvement upon Dessault's, has been suggested and used by Dr. Hodge, of Philadelphia. It consists of a bar of

wrought iron attached to the upper and outer part of the splint by means of bolts or screws and bent either to the right or left according to the side for which it is required. The splint should be sufficiently wide to allow the bar to pass free of the patient's arm and shoulder. Then the adhesive strips as previously described, are attached by means of a tape to the hook at the top of the bar, as shown in Fig. 325. The advantages of this apparatus

Fig. 325.



a. View of Hodge's Splint. *b*. Counter-extending bar as attached to long splint.

are that the extension and counter-extension are made in a straight line. That the dressings maintain their positions much better than the ordinary ones, and the patient being unable to rise the fragment are less liable to become misplaced.

The fracture-box of Dr. Gross, having been used by him for upwards of twenty years, possesses many advantages and is thus described by the author: The box, as is shown in Fig. 322 page 443, extends from the tuberosity of the ischium to a level with the sole of the foot which rests against the vertical piece provided with two slit-like holes for the passage of the extending bands. The posterior surface of the box is hollowed out for the more easy accommodation of the thigh and leg, while the side

pieces fastened by hinges to the horizontal one project so as to come to a level with the surface of the limb in front. To the outside of the box is secured a movable splint, about two inches in width, crutch-like and well padded above, and long enough to reach to the axilla, while another similarly arranged, is attached to the inside, being intended to press against the perineum. The whole apparatus is made as light as possible, and any intervals that may exist between it and the limb, after it has been properly adjusted, may be filled with cotton or tow, or what is preferable, especially in compound fractures, with wheat bran, the latter affording not only an agreeable protection to the broken bone, but absorbing the discharges and preventing the development of maggots so liable to form in such cases in hot weather. In changing the dressings all that is necessary is to let down the sides of the box, the extension being kept up by an assistant having hold of the foot. A broad leather splint extending from the groin to the knee should be accurately moulded to the parts and be firmly secured in its place by pieces of tape encircling the box.

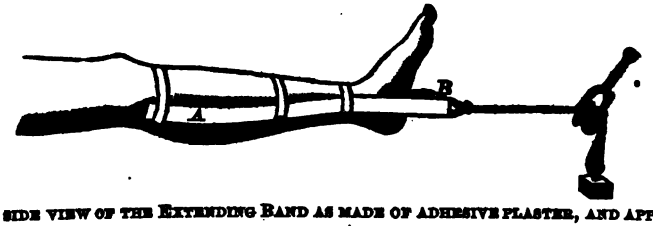
Smith's Splint.—The anterior wire splint of Prof. Nathan R. Smith, has been very highly recommended, especially in gunshot fractures of the thigh and leg. It is simply a frame composed of stout wire and covered with cloth, which being suspended above the limb permits it to be suspended in turn to it by rollers passing around both limb and splints from the foot to the groin, and should be of sufficient length to reach from the anterior superior spinous process of the ilium to a little beyond the toes. The limb is then suspended by means of hooks and cord to the ceiling or frame above the bedstead. The upper hook should be attached over the seat of fracture and the lower one a little above the middle of the leg, in order to equalize the pressure of the splint. This apparatus is applicable to any fracture of the thigh and leg, and has the advantage of being at the same time light and comfortable.

Dr. Swinburne's method of treating these fractures has at least the merit of simplicity, and consists simply of extension and counter-extension, with or without splints, the perineal and crural bands being secured to the bedstead. With this arrangement there can be no obstruction to the circulation; perfect cleanliness

can be preserved and the limb inspected and measured as often as desirable, and is particularly adapted to compound fractures of the thigh.

I employed this principle of Dr. Swinburne, with some modifications, in treating gunshot fracture of the femur, in the U. S. General Hospital, at Mound City, Illinois, and in the Good Samaritan Hospital, in this city, with the most gratifying results. The counter-extension is made by a perineal band composed of india rubber tubing, about two feet long and one inch in diameter, stuffed with cotton or flax, fastened by a cord firmly to the head of the bed. Extension is maintained by adhesive strips applied to the leg, to which a cord is attached, which passes through a pulley, fastened to the foot of the bed, and at its distal extremity a weight is suspended varying in gravity from five to fifteen pounds, according to muscular development. The thigh may be encircled with light parallel splints placed over the point of fracture, as suggested by Dr. Gurden Buck. The whole is fairly illustrated by the accompanying figure.

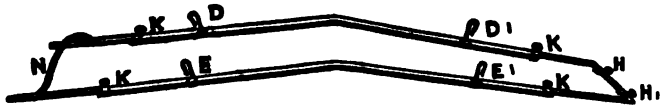
Fig. 326.



A SIDE VIEW OF THE EXTENDING BAND AS MADE OF ADHESIVE PLASTER, AND APPLIED TO THE LEG IN ALL FRACTURES OF THE FEMUR AND LEG WHICH DEMAND THE EMPLOYMENT OF AN EXTENDING FORCE.—A. The broad outside strip which is retained by the cross strips passing over to a similar wide strip on the inner side of the leg—this strip being one entire piece. B. The little block placed in the loop of the side strip where it passes beneath the foot, thus furnishing a firm support to the tape which is to be attached to the lower end of the splint, while it also keeps the pressure of the extending band off the side of the foot. (After Nature.)

Hodgen's Method.—Prof. John T. Hodgen, of St. Louis, has devised a simple but valuable apparatus which combines both the principles of the anterior splint of Smith, and the extension of Swinburne, and can be applied not only to fractures of the thigh, but also to those of the leg. Fig. 326, A. The author, from a considerable experience in its use, claims for this apparatus all the qualities necessary for the treatment of simple or compound fractures of the thigh. Says Hodgen: "The splint

Fig. 326. A.



referred to is a combination of the principles of Smith's anterior splint, Swinburne's extension, and the strip bandage supports used in my cradle splints, The cut gives a clear idea of it as applied.

The body of the splint is made of No. 2 iron wire, which is sufficient to support the limb, all of one piece, bent as seen in the cut.

The dimensions are as follows: Four inches across the bottom of the foot; twenty-two inches from the foot to bend at the knee; twenty inches from the bend of the knee to the upper ends of the wire (corresponding to the pubes and hip when applied). These upper ends are eight or nine inches apart, being separated by a bow of thick wire; another similar bow is placed at the knee, having a span of six inches.

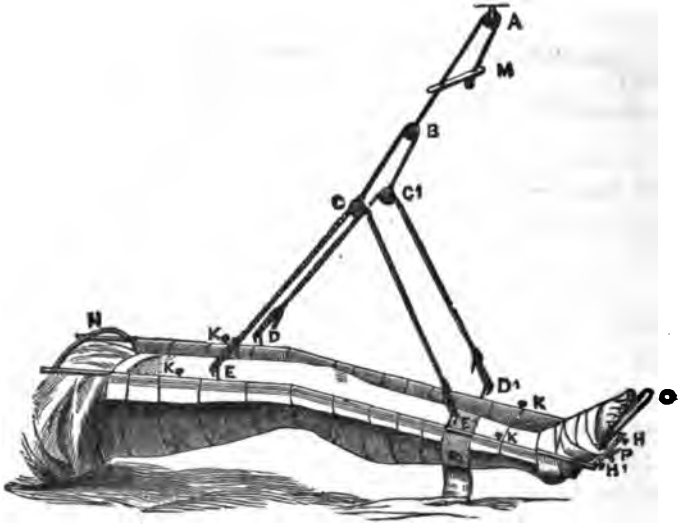
These two bows are made so that they can be put on or taken off without disturbing the dressings, and are put in position after all else is arranged—the one at the hip having a loop at each end to receive the upper end of the splint wires, the other simply hooks, to be looped on at the knee. A roller bandage may be placed around the hips and upper end of the external limb, the splint to keep the latter in place, if required."

How applied.—A bandage is applied to the foot; an adhesive strap, three inches wide, is applied to each side of the leg, extending four or five inches below the foot, and up to the knee in case of fracture of the femur; or to the fracture, in case the tibia is the injured part. The roller is then extended smoothly over the adhesive plasters.

That limb of the splint designed to pass next the pubes is bent upward, at a point from the bend of the knee in the splint corresponding to the distance from the bend of the knee to the pubes on the sound side of the body.

Strips of bandage three inches wide are now looped over one limb of the splint, continuously from the upper to the lower end,

Fig. 327.



and allowed to belly downward a distance equal to two-thirds of the diameter of that part of the extremity designed to rest upon each one; the other ends of these strips are pinned over the other limb of the splint, thus forming a double inclined trough in which the extremity is now to be placed on these strips of muslin. The free ends of the adhesive strips are next fastened to the cross-piece at the foot, three inches apart, and the whole suspended from a pulley fixed to the ceiling or a frame; the pulley should be almost over the foot, if the ceiling be eight or ten feet high, giving the suspending cords an oblique direction, that in this way we may have sufficient extension. If the patient is disposed to slide toward the foot of the bed, this must be elevated on two bricks under each of the legs at the foot of the bedstead.

The advantages claimed for this arrangement are:

"1st. That the limb is entirely free from compressing bandages, so that circulation and nutrition are uninterrupted; consequently repair goes on in its wonted course.

2d. The limb may at any time be examined without disturbing the dressings.

3d. Any one of the supporting strips may be removed and replaced without displacing the fracture; consequently the external

wound may be frequently dressed, and all offensive matter removed as often as may be required.

4th. The absence of the perineal band, and the limb being suspended on strips of muslin, there can be no perineal excoriations, no ulceration of the heel, while every part of the limb is kept cool in the hottest weather.

5th. The freedom with which the limb moves, in obedience to impulses received from the hip and upper part of the thigh, allows the patient to sit up, to move to any part of the bed, or lift himself on a bed-pan, without disturbing the fracture or causing the least pain.

All of these requisites are not answered by any splint in general use. Dr. Smith's anterior splint embraces all the qualities required for simple fractures, but it does not admit of the limb being so easily inspected, or offer the same facilities for dressing wounds of the soft parts."

I have employed this splint almost exclusively for the last two years for all fractures of the thigh and leg, and believe it to be the very best apparatus now in use for the injuries referred to.

§ 6.—FRACTURE OF THE CONDYLES.

This fracture is of rare occurrence, and usually takes place among old persons, in whom the condyles have become atrophied and brittle—either as the result of a direct blow upon the part, or a fall upon the knee. The fracture may be limited to one of the condyles or implicate both, the fissure extending between the prominences. The fracture may also be compound or complicated; either as the result of direct violence or gunshot injury.

Symptoms.—There is increased width and flatness of the joint, together with great pain and swelling of the part, with more or less shortening of the limb when both condyles are affected. There is complete loss of power in the limb, and crepitation is easily elicited by taking hold of the condyles and attempting to move them in opposite directions.

Prognosis.—The prognosis in injury of this nature is far from favorable, the knee joint being generally implicated to such an extent as to cause anchylosis, or at least imperfect action of the part. When the fracture is compound or comminuted, it is

often advisable to perform amputation at once, as by delay the life of the patient may be lost by the resulting mortification, erysipelas, pyemia or hectic fever.

Treatment.—The limb should be placed in an easy position and enveloped in compresses wet with medicated lotions of *Arnica*, *Aconite* or *Hypericum*, as circumstances, demand until the inflammation has been subdued, after which *Symphytum* internally and externally, as heretofore recommended. The fragments may then be restored to their proper position, and be maintained by either the double inclined plane or extended position; in the extended position, if the fracture be transverse; the deuble inclined plane, if it be oblique with a strong tendency to displacement. Passive motion may be instituted in about the space of a month, but despite the most careful attention, says Prof. Gross, a good and unexceptionable case will be extremely difficult, if not impossible, especially when both condyles are implicated.

Compound fracture of the condyles involving the knee joint, if there be extensive laceration of the soft parts with injury to the popliteal vessels, demands either exsection or amputation, according to circumstances.

SECTION VI.

FRACTURES OF THE PATELLA.

Fracture of the patella, though by no means a common accident, is still one of great surgical importance, owing to the imperfect union of the fragments, and the subsequent impairment of the functions of the knee joint. The injury is due in a large majority of cases to direct violence, as falls or blows, while occasionally it is produced by muscular contraction alone. When resulting from the latter cause, the direction of the fracture is found to be transverse, the same being generally true also of fractures occasioned by direct force. Longitudinal, oblique and comminuted fractures of this bone are extremely rare, but when occurring, usually demand the closest attention, in view of the danger to be apprehended of high inflammatory action, which is exceedingly liable to extend to the interior of the joint, thus

complicating the case with synovitis, and perhaps ultimately with more or less complete anchylosis.

Symptoms.—Provided the fracture be transverse, the superior fragment is drawn upward by the action of the quadriceps extensor muscles, the lower fragment being retained in position by the ligamentum patellae, the interval thus produced between the fragments can be readily detected, and is found to vary in extent from a few lines to four of five inches, according to the degree of laceration sustained by the ligamentous structures surrounding the bone. The patient is unable to stand, while the ability to straighten the limb is completely lost. More or less swelling rapidly supervenes, which is liable to obscure the diagnosis, especially if the displacement be slight. There is also discoloration of the integuments owing to the effusion of blood.

Crepitation can rarely be elicited unless the fracture be longitudinal or oblique, as the superior fragment cannot be readily brought in contact with its fellow.

Prognosis.—The prognosis in simple fractures of the patella is generally favorable as regards the ability to walk, though it is to be especially recollected that the functions of the knee joint will seldom be as perfectly formed as before the injury. The dangers to be apprehended are, first, inflammation, which is liable to extend to the interior of the joint and occasion a more or less permanent anchylosis; while, secondly, owing to the difficulty of maintaining a perfect coaptation of the fragments, nothing but fibrous union ordinarily occurs, thus somewhat weakening the joint; the ability also to extend the leg completely being generally lost.

Treatment.—The indications in this fracture are to control the action of the extensor muscles, to bring the broken fragments in apposition, and retain them by means of appropriate apparatus. These indications are accomplished in various ways by different authors. The apparatus of Malgaigne has been found to be very useful. It is easily applied, and when once in place does not require to be removed during the whole course of treatment, the amount of pressure being regulated by means of a screw. In applying it two of the hooks are fixed into the tendon at the upper edge of the bone and two into the lower,

then by turning a screw the fragments are brought into place and retained there; bony union usually takes place in about six weeks. Prof. Gross, in treating this fracture, uses a well-padded tin case, long enough to reach from the middle of the thigh to a corresponding point of the leg, a roller having been previously applied from the toes upward, and another from the groin downward. The superior fragment being brought into place, is confined by adhesive strips carried around the bone above and below the joint, and connected by vertical and transverse pieces. A long, thick and narrow compress is then carried around the upper border of the patella, and confined by two rollers passed around the joint in the form of the figure 8. The tin case maintains the limb in the extended position, the adhesive strips and compress retain the fragments in position, and the rollers aid materially in controlling muscular action. In order to prevent anchylosis passive motion should be employed at about the end of the third week. As this fracture is liable to recur from slight causes, the patient must be very careful for a long time.

Dr. W. A. Gibson reports (*St. Louis Med. and Surg. Jour.*, Oct. 1866), a case of transverse fracture of the patella thus treated. He took a measurement of the sound patella, and had a ring made of iron (allowing for padding), which he padded well with cotton wadding, cut in strips and wrapped around the ring, over which he applied a bandage. To each side of the ring he sewed strips of bandage. He then placed a well-padded splint twenty-four inches long to the posterior aspect of the leg and thigh, which was secured by a few turns of bandage at the lower and upper ends, the bandage being loose so as not to interfere with the circulation. He next brought the two fragments of bone into apposition, and placed the ring around the patella, and tied the strips of bandage over the splint, thus securely holding the ring in its place, and keeping the broken bone always in complete apposition, thereby giving the greatest possible chance for a bony union. At the expiration of thirty days, he removed the ring, and commenced passive motion of the limb, and found the union to be bony and complete, and to-day (June 15th) he has very good use of the limb.

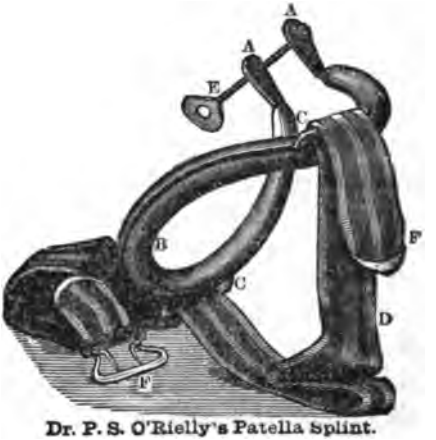
"The appliance," he says, "did not give the patient the least

pain, and there was no interruption of the circulation by the bandages. It was impossible in this case for the patella to escape from the ring, but possibly, in some cases, as of women, when there is a good deal of adipose tissue, and but little prominence of the patella, it may not be so easy to apply the ring; but I am persuaded that it will give entire satisfaction in all cases. I claim by the application of the ring to have reduced one of the ugliest fractures of the human frame to one of the simplest for treatment."

Prof. Paul T. Eve, of Nashville, Tenn., treated two cases successfully by the use of Gibson's ring, and extols it for its simplicity, and says. "The ring must have a great and decided advantage over all other means proposed to retain the fragments of a fractured patella in contact."

Dr. P. S. O'Rielly, of St. Louis, has devised a ring which he claims possesses advantages over the more simple ring used by Dr. Gibson. Dr. O'Rielly's ring consists of a piece of round, tempered steel, of an oval horse-shoe shape, with the ends turned in and bent upward as is shown in Fig. 328. On the sides near the center of a line drawn through the oval part are loops to receive the band which holds the splint in position. The limb is placed upon one of Day's posterior splints, well padded and a little wider than the leg, and secured at each end by a handkerchief or roller bandage. The iron ring is then placed in position over the patella, the divided fragments having been pushed together, and the strap buckled sufficiently tight to keep the splint in place. The thumb-screw regulates the amount of concentric pressure desired, and may be tightened or relaxed as circumstances require. The accompanying figure, 329, shows the

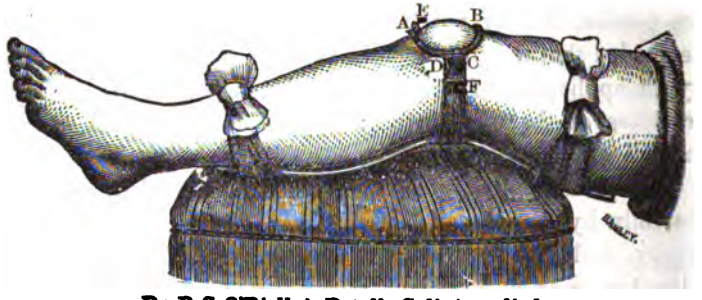
Fig. 328.



Dr. P. S. O'Rielly's Patella Splint.

application of O'Rielly's ring, and one of Day's posterior splints.

Fig. 329.



Dr. P. S. O'Rielly's Patella Splint applied.

In the description of this apparatus the author says: "This splint consists of a piece of rounded, tempered steel, and, as may be observed from the illustration, is of an oval, or horse-shoe shape, with the ends turned in and bent upward. The sides are depressed so that the part corresponding with the toe (B) of the shoe is curved upward, to the extent of about half an inch, allowing it (the toe) to ride over and upon the ligaments of the rectus muscle, while the sides dip downward and embrace the bone, and at the same time, the splint, by pressure at the insertion of the vasti muscles, counteracts the action of the latter; and nevertheless, does not by undue pressure upon the tendon of the rectus muscle, cause the fragment to tilt up at the point of fracture, as necessarily results when the pressure is made on this tendon alone, as in the use of the simple ring. On the sides, slightly anterior to a line through the centre of the oval, or horse-shoe part, are fixed ears or loops (C) for the reception of the band (D) by which the shoe portion of the splint is held in position. Through the turned up end of that portion corresponding with the heel or calk (A) of the horse-shoe, is a thumb-screw (E) by which the splint is compressed or expanded as may be required. The splint being covered with chamois or soft felt and a strap of silk or linen webbing (D), or smooth leather, with a buckle (F) on one end, the free end of the strap is made to pass through one of the ears, rendering it complete for application. The injured limb being

laid upon one of Day's curved posterior splints, well padded, and a little wider than the leg, secured at each end by a handkerchief or roller bandage, the fragments then being brought into position, the *Patella Splint* is placed over and made to encircle them; the strap (D) is carried under the leg and around Day's splint and run through the opposite loop or ear, and returned upon itself and buckled (F) sufficiently tight to keep the splint in position, but not so much so as to inconvenience the patient more than is necessary. By the thumb-screw (E) the splint may be tightened or relaxed, as circumstances demand. Cold applications can now be applied *ad libitum*.

In the case of dislocation of the patella upwards, in the rupture of the ligamentum patellæ from the tuberosity of the tibia, by means of the attachment of an elastic strap to the ears or loops, and by passing it under the sole of the foot, the most perfect approximation may be secured. The ears or loops which are manufactured of hard, tempered steel, should extend out at least a quarter (¼) of an inch from the body of the splint, so as to keep the strap out from the leg, obviating the pressure and thus preventing constriction upon the cutaneous vessels.

I would state, without intending to offend the intelligence of any of the critics, that the '*splint*' is not a ring, at least according to the ordinary conception of the meaning of the term, or in accordance with the definition of the leading lexicographers of the day. As the patella bone is not round, but of a triangular or heart-shaped figure, a splint that embraces its fragments ought to be as near its shape as possible in order that it may be successful.* This fact may account for the failure of the Purmann's ring and have caused it to fall into partial disuse.

Dr. E. A. Clark, who had charge of the Public Hospital of St. Louis, Mo., in relating his experience of this splint, says: 'The fragments were held in good position; and the callus, I am confident, became perfectly ossified, while the patient complained of no pain, not even from pressure.' I regret, however, that the Doctor failed to inform us whether there was a rupture of the ligaments or not. The accomplished author and teacher,

* The average size from A to B is 3¼ inches, from ear to ear, 2¾ inches

Professor Paul F. Eve, of Nashville, Tenn., who has become venerable in the practice of his profession, says: 'It is the most perfect contrivance yet proposed, and fills a most important gap in surgical appliances, the want of which has long been felt.'"

Prof. Hamilton's method of treating this fracture is by the single inclined plane of sufficient length to support the thigh and leg, and about six inches wider than the limb at the knee. The plane rises from a horizontal floor, and at its distal end is from six to eighteen inches high according to the length of the limb and other circumstances. The foot piece stands at right angles with the inclined plane, and is perforated with holes for the passage of bandages to secure the foot. After *recovery*, a pasteboard or leather cap should be worn around the joint for some time, and until the ligamentous bands which unite the fragments have attained the necessary degree of firmness to resist any ordinary force to which they may be subjected. The duration of treatment is about six weeks, the cap then being placed over the joint as above directed. The inflammation must be combatted by the remedies already given, and *Symphytum* administered both internally and locally.

Compound fracture of this bone involving the knee joint, must be treated upon the principles already laid down. If very severe, operative procedure may become indispensable.

SECTION VII.

FRACTURES OF THE BONES OF THE LEG.

Simultaneous fracture of the tibia and fibula commonly occurs as a result of direct violence, as a blow, or the passage of a loaded vehicle. Of indirect causes, the most frequent are falls upon the feet from a height, while occasionally the accident results from muscular contraction.

The *seat* of the fracture is confined in a considerable majority of cases to the lower third of the leg. Thus, of one hundred and fifty-five cases collated by Hamilton, eleven belonged to the upper third, forty-five to the middle, and ninety-three to the lower. Concerning these examples this author remarks, "It is probable that in this analysis some errors have occurred, and that in a

larger proportion than here stated, the two bones have given away at opposite extremities, since it is often difficult, and sometimes quite impossible to determine precisely where the fibula is broken; but the analysis is sufficiently correct to illustrate the much greater frequency of fractures of the lower third, and also that the two bones generally break nearly on the same level; usually the point of fracture in the tibia is between two and three inches above the joint, where the bone is weakest."*

Fractures of the bones of the leg may be simple, oblique, comminuted or compound, the two latter varieties being more frequent here than in any other portion of the skeleton.

Symptoms.—The characteristic signs of fracture, to-wit: preternatural mobility, crepitation and deformity are commonly so well marked in the accident as to render the diagnosis easily determined. The shortening, when it exists, may vary from one or two lines to three quarters of an inch, being rarely more than this on account of the office performed by the interosseous ligament. In addition to the above symptoms, there is swelling and discoloration, the latter often being very considerable from infiltration of blood poured out of the anterior or posterior tibial artery or veins, which are frequently wounded by the displaced fragments.

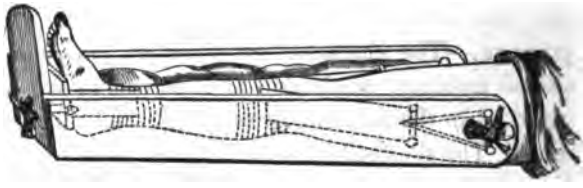
Prognosis.—With proper treatment, union is rarely delayed beyond thirty or forty days, the patient recovering, under ordinary circumstances, without perceptible deformity or loss of function.

Treatment.—When the fracture is transverse, the leg should be confined in a tin case or simple fracture box, and any tendency to displacement counteracted by the use of compresses or short splints, care being taken to keep the great toe on a line with the inner border of the patella, thus preventing rotation of the ends of the fragments upon each other; or the limb may be confined in a starch bandage after the subsidence of the inflammation and swelling, and perhaps in many cases this latter is the better method, as by its use the patient is able at the end of a week or two to get up and move about by the aid of crutches,

* Treatise on Fractures and Dislocations, p. 462.

the limb being supported by a sling passed around the neck *oblique* fracture of the leg it will be found necessary to e extension and counter-extension in order to keep the frag in apposition. The apparatus of Dr. Neill is found very ful in these cases; it consists of a box reaching as high a middle of the thigh, the extension being made by means of hesive strips fastened to the footboard, and counter-extensio means of adhesive strips passed through holes in the upper of the box, and tied on the outside, as shown in Fig. 330.

Fig. 330.



John Neill's apparatus for fractures of the leg, requiring extension and counter-extension.

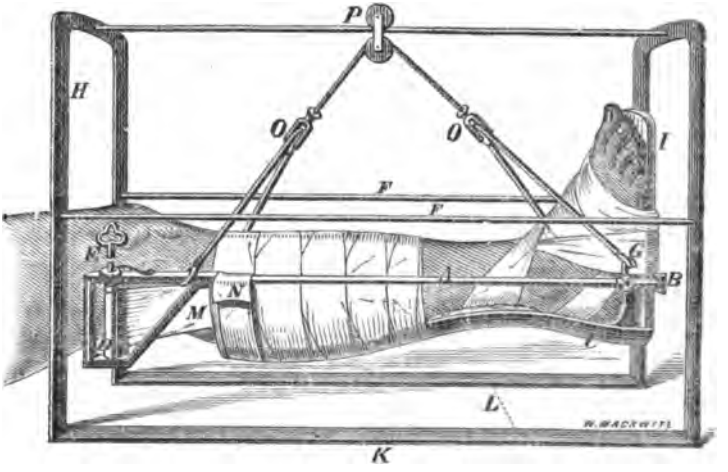
The McIntyre splint as modified by Liston, is also of value *in* the treatment of these fractures. It may be found fully described under the head of Fractures of the Thigh, page 446. Swinburne's method of treating this fracture is by means of a long, narrow splint and foot-piece. The foot-piece is fastened to the foot by adhesive strips, while counter-extension is made from the knee by means of adhesive strips looped about the limb below the joint. A strong cord is then passed through the loop and then through a hole in the splint opposite the lower part of the thigh, in order to afford the requisite degree of tension. In order to keep the apparatus steady, a few strips of plaster may be passed around the limb and splint. In fractures of this kind it has been recommended to suspend or sling the limb by means of a suspending apparatus, thus affording greater relief to the patient with less risk of disturbing the healing process going on in the fractured extremities.

Clark's Apparatus.—The following suspension apparatus is claimed by the author to be an improvement over those invented by Crandall, Salter and Neill, not only as a means of extension and counter-extension, but also in its adaptation to the treatment of compound fractures.

"The apparatus is such as may be made by any blacksmith, or indeed by any ingenious surgeon in a case of necessity, as a wooden frame and two hoops with a common iron pulley may be made to answer quite as well as the instrument which I have had made of iron on the following plan:

The two arches, represented by the letter (H) at one end, are made of iron bars one-eighth of an inch in thickness, and three-fourths of an inch in width, and are continuous with the bottom pieces (K), which rest upon the bed and measure twenty-two inches in length. The arches are also supported on the sides by the two slender bars or rods (F, F), while the bar supporting them at the top, upon which the pulley (P) glides, should be made flat, with the long diameter vertical, and of sufficient strength to prevent it bending with the weight of the leg. The width of the arches, as indicated by the letter (L), should be fifteen inches, and their height eighteen inches from the surface of the bed.

Fig. 331. No. 1.



This description will be sufficient to indicate the proportions of the exterior apparatus.

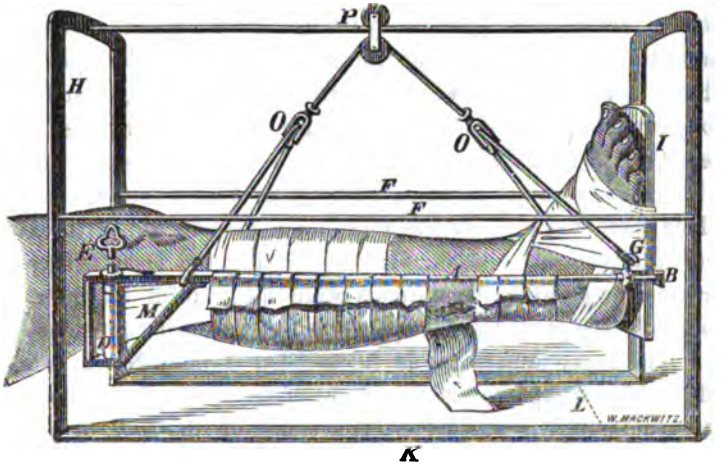
The bars (A) of the frame or portion of the apparatus in which the leg is suspended, should be about two feet in length—unless when the fracture is so close to the knee that it may be necessary to attach the adhesive straps (M) above the knee, when

the bars may extend to near the perineum if necessary—and the crossbar passing beneath the foot-piece (I), and upon which the foot-piece rests by means of a suitable hook or bracket (B), should be flattened, the more readily and securely to engage in the hook or bracket, and be five inches in length so as to allow ample space for the limb to rest between the bars; the space between these bars at the upper end should ordinarily be about six inches. The splint (C) upon which the leg rests in figure No. 1, should be concave upon its upper surface and conform to the shape of the leg, and should also be made oval upon its under surface, so that both the leg and the splint may be included in the bandage, as shown in figure No. 1, by which means any displacement may be corrected in the fracture and the bones kept in perfect apposition. The foot-piece (I) should be attached to the posterior splint at an obtuse angle, so as to correspond with the natural position of the foot. The foot is bound to this piece by adhesive straps, which may embrace the whole of the foot, and extend partially over the ankle, but not so as to arrest the circulation, as by the figure-of-8 bandage formerly used around the ankle for making extension. The leg then, as seen in figure No. 1, is supported upon the crossbar passing under the bracket (B) attached to the foot-piece, and by resting upon the strap (N), pinned over the bars (A) on either side, while the extension and counter-extension is effected by means of the crossbar and hook or bracket attached to the foot-piece below, and adhesive straps (M) above, three inches in width, which are attached to the sides of the leg, beginning just above the point of fracture and passing up to be wound around the cylinder (D), which is three and a half inches in length, is turned by means of an ordinary clock key (E), and is held in any position to which it may be turned, by a ratchet and wheel placed upon the upper surface of the bar, as indicated in the diagram.

It will be observed in figure No. 2, that there is no posterior splint as in the other diagram, but that the leg is supported entirely by strips of muslin pinned over the bars on either side, rendering the apparatus more appropriate for the treatment of compound fractures, as the wound may be examined and dressed when necessary, by removing one or more of these strips, which may

be replaced by new ones without disturbing the fracture. The attachment of the foot-piece in this dressing does not in any particular differ from that of figure No. 1, and the method of suspension is the same in both these dressings. By means of the pulley at the letter (P), the patient is enabled to move his limb,

Fig. 332. No. 2.



or even his body, forward and back to the extent of the length of the bar upon which it glides; and by means of the cord playing over the under wheel in the same pulley, the patient is able (when the fracture is not so near the knee as to necessitate the apparatus extending above the knee) by a very slight effort, to flex or extend the knee by depressing or elevating the foot, while at the same time he can swing the leg from side to side to any extent within the space of the arches; and by means of the cords playing through the pulleys at (O,O), the leg can be rotated to any extent, even to allow the patient to lie upon his side if he desires, without disturbing the fracture in the least. It will be observed in the diagrams that at the letter (G) there is a thimble, which can be made to slide upon the bar. by means of which—sliding this thimble forward or back, and fixing it at any point by means of the little thumb-screw attached to the thimble—the lower end of the leg can be elevated or depressed at the will of the patient."

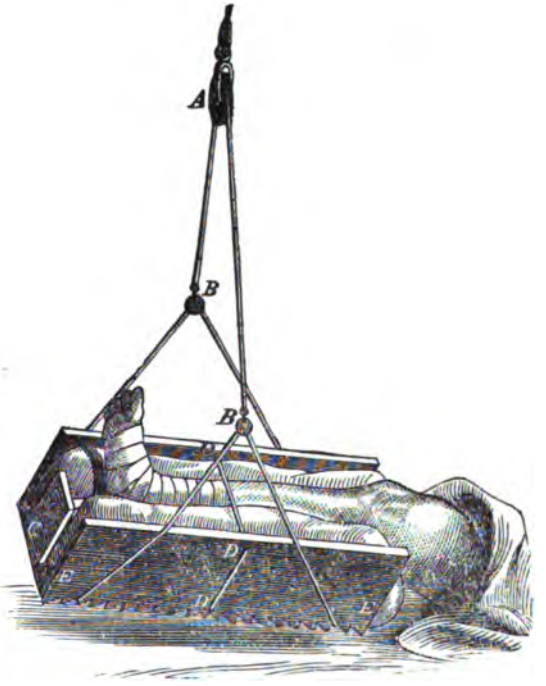
"In developing the utility of this apparatus for the treatment of fractures of the leg," says the author, "I have tried various

means of attaching the foot to the foot-piece, such as muslin and flannel bandages in the ferm of a figure-of-8 around the ankle, covering the foot also, as far as the toes, but have always found them objectionable from the great amount of pressure and consequent arrest of circulation in the foot; though the flannel bandage is much less objectionable than the muslin. But I have been able to obviate this objection by the use of the adhesive plaster attached over the front of the foot, and around the foot-piece, as shown in the diagram, which I have always found quite sufficient to secure the position of the foot. I have, during the past three years, treated a large number of cases of fractures of the leg with this apparatus, in which both bones were fractured, and in which there was more or less shortening in each case, with excellent results in all of them, without allowing the least deformity or shortening, while the patients were all grateful for the comforts afforded them by this apparatus during their confinement."

"The above apparatus, as represented in plate No. 2, is also admirably adapted to the treatment of fractures of the fibula at the usual point, in which there is eversion of the foot, or partial dislocation of the ankle joint outwards. By attaching the foot, with adhesive strips, to a foot-board about one inch narrower than the space between the two bars of the iron splint at the lower end, and then inserting a wedge on the outer side of the foot-piece, so as to force the ankle in close to the inner bar, and passing a strip of muslin, three or four inches in width, around the inner side of the lower third of the leg and tying it tightly around the external bar of the splint, the leg is thus drawn outward by the band, while the foot is forced inward by the wedge, and the displacement entirely corrected. The leg is then suspended as in other fractures occurring in its shaft."

Hodgen's Apparatus.—The suspension apparatus of Prof. Hodgen, shown in Fig. 333, is composed of three boards, each two feet long. The side pieces, which are fastened together at lower edge by means of cords, are eight inches wide; while the bottom piece, which should be light, is only six inches, and has attached to one end an upright piece, represented at (C), for extension of limb. In order to suspend the box, two cords of equal length, one upon each side, *e. g.* (E, B, E), should pass over pulleys at

Fig. 333.



Dr. Hodgen's apparatus for suspension of inferior extremities, in case of fractures or other injuries.

(B, B), which are fastened to the ends of cord (B, A, B), which passes over a third pulley at (A), and this is fastened to ceiling, or some point above, by means of a cord.

The great advantage of the splint is in the rotary movement permitted by pulley at (A), which gives the patient a freedom of motion which is denied by the common splints. The pulleys at (B, B), permit flexion and extension of leg. The pulley at (A) should be large; the cord (B, A, B) should be about four feet long; and the cord (E, B, E), as also its fellow, should be fastened to lower edge of side pieces, to give easy and regular movement to the limb.

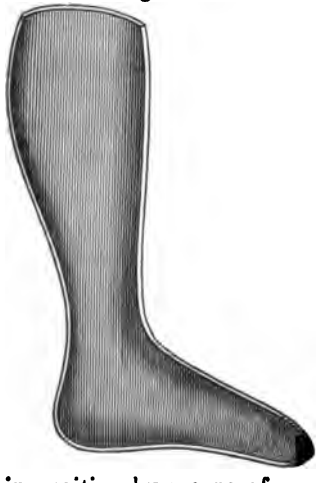
The only dressing that the limb needs, consists of two or three strips of adhesive plaster. Having completed the arrangements for suspension of the splint, we place a wide and thick cushion on the bottom of the box, and then place the leg in the box

bring the side pieces to a perpendicular position, and maintain them by means of a cord which passes around the box, or as represented by cord (D, D, D). When the apparatus is well adjusted, and the leg placed well up toward upper edge of box, the patient can turn from one side to the other with ease, thus obviating all danger of bed sores.

In compound fractures, the cord to which the pulley (A) is attached, should pass over a pulley in the ceiling, and have its end fastened to one end of a slide. This slide should be of hard wood, four inches in length by one in thickness, and have a hole in each end large enough to let the cord pass through. The cord ascending from (A), passes through one end, and to the other, the end of cord is secured. By moving slide, the box can be elevated or depressed, at pleasure. When the box is let down, the cord (D, D, D), and the fastening at (C) loosened, the leg may be lifted from its bed, and clean dressings applied.

The apparatus gives to the patient a freedom of motion, which is not only a great comfort, but also a great benefit, and is not detrimental to the fracture.

Fig. 334.



An excellent splint, although one adapted, like the perforated and carved splint, rather for the later than for the early stages of the treatment, has, for twenty odd years, been made of *felt* from the hat-makers, by cutlers in Philadelphia. Fig. 334. A sheet of this article may be cut into a shape approximating that of the limb, and having been soaked in boiling water till rendered perfectly flexible, and cooled sufficiently to avoid vesicating the cuticle, applied to the limb, carefully moulded to suit all inequalities, and held in position by means of a roller. After having been allowed to harden, it may be taken off, coated three or four times with copal varnish, which will give it a firmness almost equal to that of the carved wooden splint, and then being carefully padded with cot-

ton wadding, may be reapplied. Thin strips of wood coated with muslin, kid, etc., so as to be flexible, have also been long used, on the recommendation of Benjamin Bell; in fact, there is no limit to the variety of material thus employed, and especially as applied to the leg.

After three or four weeks, when union is far advanced, the limb may be advantageously surrounded with moulded and well padded *pasteboard* or *felt* splints, and be replaced in the fracture box, or it may be put up in the starch bandage and the patient be permitted to go about on crutches. Throughout the treatment, the surgeon at every visit should examine the position of the leg and adjust all derangements that may exist. The foot should be kept at a right angle with the leg; excoriation of the heel be prevented by well adjusted compresses, and any tendency to lateral displacement counteracted. A good rule is for the surgeon daily to examine the limb and see that the *ball of the great toe*, the *inner malleolus*, and the *inner condyle of the femur* are in the same vertical plane.

If the fracture be very oblique and therefore difficult to keep in apposition, extension may be kept up by the ordinary stirrup of adhesive plaster, pulley and weight, according to Swinburne, Buck and others. The anterior splint of Hodgen as heretofore described, or Neill's apparatus (Fig. 330), which consists of a box reaching as high as the middle of the thigh, the counter-extension being made with adhesive strips passed through holes at the upper side of the apparatus, and tied at the outside, as seen in the figure, may be advantageously employed.

Compound fractures of the leg are correspondingly more dangerous and more difficult of cure, and the greatest care and skill of the surgeon will be required throughout the treatment. Dr. Barton's *bran dressing* in conjunction with Hodgen's fracture box, is particularly useful on account of its cleanliness, lightness and absorbing properties, and should be employed in lieu of the ordinary dressings. In warm weather the bran may be made a sure protection against flies and maggots by soaking it in a solution of carbolic acid, drying it in the sun and applying as before. The usual remedies for inflammation must be used both internally and externally, and the wonderfully curative powers of

Symphytum will materially assist the efforts of the surgeon in bringing about bony union.

§ 1.—FRACTURE OF THE FIBULA.

Fracture of the fibula may occur at any part of its extent, and is readily recognized by simple manipulation; the mobility of the fragments, crepitation and displacement being easily detected.

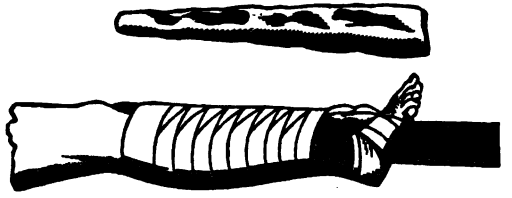
The degree of deformity, however, is commonly slight, owing to the support afforded by the tibia which acts as a splint in maintaining the broken extremities of the bone very nearly in apposition. The accident may occur as a result of force applied to the plantar surface of the foot, as in falling or jumping from a height; from a sudden twisting of the ankle; or in consequence of direct blows.

The more serious accident, however, implicating the fibula, is what is commonly known as "Pott's Fracture," the seat of the fracture being confined to the lower fifth of the bone, and complicated with dislocation of the tibia from the corresponding surface of the astragalus. The foot is strongly everted by the action of the peroneus longus, while the heel is somewhat elevated by the muscles of the calf. The internal lateral ligament is ruptured, and the internal malleolus projects inward thus producing considerable deformity. Not infrequently there is also fracture of that portion of the tibia which is more immediately connected with the fibula.

Diagnosis.—Provided the degree of eversion of the foot be slight, and the swelling considerable, the diagnosis may be somewhat difficult, as a simple sprain or rupture of the ligaments will often closely simulate this fracture. The true nature of the injury can, however, be ascertained by passing the fingers carefully along the bone, when a slight movement of the fragments will be apparent; while it is also found possible to evert the foot preternaturally, thus indicating the loss of function suffered by the external malleolus.

Treatment.—The indication is to place and maintain the foot in a position the reverse of that which it assumed in consequence of the injury. This is best accomplished by the employment of Dupuytren's apparatus, as shown in Fig. 335. It consists of a

Fig. 335.



A side view of Dupuytren's Pad and Splint for the treatment of fracture of the lower fifth of the fibula as applied to the right limb. (After Nature.)

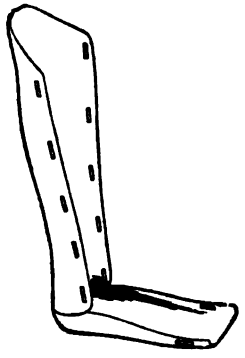
light wooden splint reaching from the upper third of the leg to about three inches below the sole of the foot, and a wedge-shaped cushion reaching from the same point to the ankle. The limb is then enveloped by the common bandage, care being taken not to compress it opposite the site of fracture, the apparatus is stretched along its inner surface with the tapering end of the pad upward and secured, first above and then below, the roller being passed around the foot and ankle so as to turn the internal margin of the foot upward and inward. The limb may afterward be kept in the extended position, or be placed half bent upon its outer surface. The parts should be carefully watched, the dressings changed from time to time, and passive motion instituted at the end of the third week.

§ 2.—FRACTURES OF THE TIBIA.

Fractures of the tibia are produced in a large majority of cases by the application of direct violence, though they are sometimes occasioned by falls upon the foot. The accident is generally complicated with fracture of the fibula. The fracture is generally oblique and seated in the lower fourth of the bone, the particular form of displacement depending upon the direction of the fracture. Thus, if the separation occurs from above downward and forward, the fragments will override each other, the lower one being drawn upward and backward by the action of the gastrocnemius and soleus muscles; provided, however, the direction of the fracture be from above downward and backward, the heel will be drawn upward by the same muscles, thus causing the inferior fragment to project forward. In either case the sharp extremity of bone is liable to protrude through the integuments and produce a compound injury.

Treatment.—Fractures of the tibia, at whatever portion of the limb they may occur, are best treated by means of the tin case and so shaped as to fit the limb. It should reach a few inches above the knee and be provided with a foot-piece as shown in Fig. 336. The limb should be bandaged in the usual manner, and any tendency to displacement counteracted by the use of a compress, so arranged as to bear equally upon the ends of the fragments. In speaking of this manner of treatment, Prof. Gross remarks: "I have never found it necessary to employ any other apparatus than the tin case, no matter where the tibia has been broken." Another method of treating fracture of the tibia, in the upper extremity, extending into the condyles, is to place the limb in a straight position, so that the condyles of the femur may act as a splint and preserve the broken parts in their places, extension and counter-extension being maintained by two long splints. The whole limb should be raised so as to relax the extensor muscles of the knee. *Pasteboard* or *felt* splints and starched bandages may also be applied to keep the joint motionless, "care being taken that they do not cover the front of the knee." Passive motion should be commenced in about five weeks. In treating these fractures of the body of the bone, the wooden splints of Dr. Welch and the wire apparatus of Dr. Bauer will be found exceedingly efficient—the latter being particularly valuable on account of its light, airy and pliable character. Hodgen's splint answers an admirable purpose in this as well as other fractures of the leg. The treatment will be the same as in ordinary cases.

Fig. 336.



SECTION VIII.

FRACTURES OF THE TARSUS.

The bones of the tarsus are rarely the seat of fracture, though any of them are liable to this variety of injury.

The **astragalus** may be broken in consequence of falls upon

the feet, or more rarely, by being crushed between opposing bodies. Commonly very little or no displacement occurs, and owing to its situation, the character of the surrounding structures, and the severe swelling ensuing, the true nature of the case is not always readily determined. Crepitation, which can ordinarily be elicited, will, however, serve to establish the diagnosis.

Fracture of the calcaneum may result from the same causes as those producing a like injury of the astragalus, while it is also liable to be broken by violent contraction of the gastrocnemii muscles. When produced by the latter cause, the line of fracture is always situated at some point intermediate between the astragalus and the insertion of the tendo-Achillis, in which case the posterior fragment is liable to be drawn upward.

The *symptoms* pointing to fracture of this bone are pain, slight displacement, together with swelling, crepitation and loss of motion in the foot.

The other bones of the tarsus are rarely broken, except by the application of such violent force as renders the injury compound, and of so serious a character that immediate amputation in a majority of cases promises the only proper resource.

Prognosis.—In fracture of the astragalus the chief danger to be apprehended is anchylosis, more or less complete, of the ankle joint; while in the other bones there is also a strong tendency on the part of the fragments to become carious, thus ultimately demanding removal, or perhaps amputation of the entire foot. This is especially the case in compound fracture.

Treatment.—In fracture of the astragulus without serious lesion of the ankle joint or soft parts, an attempt may be made by extension and pressure to restore the parts to their natural position, but failing in this, recourse must be had to excision.

In fracture of the calcaneum where there is no displacement it is only necessary to keep the foot and leg in a quiet, relaxed condition, with a tin case, or two side splints, the inflammatory action being subdued by the usual remedies. Where there is displacement the best mode of treatment is by means of a short splint applied to the anterior part of the limb. It should be adapted to the shape of the limb, be well padded, and reach from the middle of the leg nearly as far as the toes. By this means the leg and

foot is maintained in an extended position and the muscles of the calf relaxed. The upper fragment is kept in place by applying adhesive strips and a compress around the heel and sole, and then bandaging the foot and leg in opposite directions. This position should be maintained for about six weeks. The inflammation, which in some cases is considerable, should be combatted by the usual remedies.

SECTION IX.

FRACTURES OF THE METATARSUS AND PHALANGES.

Fracture of the metatarsal bones, results from direct blows or from the passage of heavy vehicles, and is commonly accompanied by complications of so serious a character that amputation becomes a necessary resource sooner or later. It is also to be observed that the usual persistence of inflammatory action in the dense fibrous structures surrounding these bones, is particularly liable to occasion caries or necrosis of the injured bone. This is frequently the case in injuries that seem comparatively slight.

Provided only one of the metatarsal bones is broken, little or no displacement will ordinarily occur; there are, however, occasional exceptions to this rule, while a considerable degree of deformity is apt to result in case two or more of them are broken at the same time. Thus, Malgaigne relates an example in which three of the middle bones suffered fracture from the passage of a carriage wheel, the proximal fragments continuing permanently displaced to such a degree as to require the patient to wear a special shoe.

In conducting the treatment great care should be exercised to coaptate the fragments as perfectly as possible, as the slightest variation is likely to produce more or less serious inconvenience, and considerable force by way of depressing or elevating the fragments, may with propriety be employed, unless the displacement should result in consequence of muscular contraction; in the latter case such a course is inadvisable. Apposition is to be maintained by pasteboard splints, compresses and roller, combatting the inflammation by the use of medicated dressings as previously advised.

The phalanges are liable to be broken by the same class of causes that produce fracture of the metatarsus, and like the latter are generally so severely injured as to necessitate their removal. In case, however, it be thought advisable to attempt the saving of the toe, it should be supported by a long and broad splint extending the entire length of the foot.

Compound fractures of the leg and foot are to be treated on the same general principles already laid down. When there is much contusion of the soft parts *Arnica* is the appropriate remedy ; *Hypericum* for laceration of the soft tissues, and *Calendula* for suppurative action consequent upon the injury to the soft tissues. In all cases of fracture, when bony union is tardy, great benefit will be derived by the internal and external use of *Symphytum*. I have witnessed the most marked benefit follow the use of the latter remedy, and especially in those cases where ossific union from constitutional or other causes seemed indisposed to take place. In one case of fracture of the patella occurring in a lady over sixty years of age, and where bony union failed to take place under ordinary treatment, this remedy produced the most gratifying results, inciting the parts to a healthy action, and bringing about perfect osseous union in less than three weeks. This is only one of many cases where I have witnessed the brilliant effects of *Symphytum* in restoring vital action, and in bringing about bony union.

PART XVIII.

OPERATIVE SURGERY.

CHAPTER I.

GENERAL REMARKS IN REGARD TO SURGICAL OPERATIONS.

The *operative* department of surgery, which embraces every manipulation of the chirurgic art, from the introduction of a catheter, to amputation at the hip joint, has within the last decade undergone marked improvement. The rapid increase of Homœopathy, and the adaptation of its therapeutics to the cure of many surgical diseases, in the hands of a corps of skillful and accomplished surgeons, has done much to lessen the frequency of *operative* procedures, and the surgery of to-day unlike that of a few years ago has strictly put on the garb of conservatism. The success attending homœopathic medicines in the cure of many diseases pronounced incurable under allopathic practice save by the use of cutting instruments, has been abundantly attested in the various journals of our school. Still there is greater progress to be made in this direction, and with the marked improvement in the past, let us hope that the future will bring equally good results, until it shall be demonstrated and proven before all men, that homœopathic surgery is as far in advance of its allopathic rival, as this new system of practice is superior to the old.

Yet despite the best directed efforts of the surgeon in the application of the law of *similia*, there are many diseases,

lesions and injuries that demand operative interference to save both life and limb. It is my intention, therefore, in this and the following chapters, to present to the student those operations that are necessary to be performed as a consequence of existing disease, injury, etc., relief not having been procured by medical treatment.

Surgical operations must sometimes be done on the instant, from urgent necessity, as, for example, when a foreign body is impacted into the trachea, it is imperative to open that tube; or, in compression of the brain from depressed bone, to elevate the offending fragment. It is therefore important that the surgeon be prepared on all occasions to act with promptitude, and with a thorough knowledge of the resources of his art, for the successful employment of which, he should cultivate a habit of neatness and accuracy in every detail that looks to the welfare of his patient. When no such urgency exists, all arrangements should be deliberately made, and all precautions adopted which may tend to insure the greatest degree of success.

Much depends upon the surroundings of the patient. These should be as cheerful as possible, without excitement. A well ventilated room and proper diet are always essential, and in many cases trained attendants must be secured. In hospital practice these things ought to be matters of course; in private, the surgeon must see to them in each instance.

When the case is one of injury, a careful inquiry should be made as to the existence of other lesions; thus, it would be useless to amputate an arm or leg for compound fracture, if the patient were suffering also from laceration of the brain-substance, or from rupture of the liver. The same is true of disease; it would be folly to remove a cancerous mamma, if the axillary glands were involved, or a cancerous testis, if the lumbar glands were implicated.

The probability of success in an operation is much lessened by morbid constitutional states, such as typhoid fever, syphilis, or phthisis; by nervous disorders, such as chorea, epilepsy, or delirium tremens; or by disease of important organs, such as diabetes, or fatty liver. Excessive timidity in the patient is sometimes an adverse condition.

A thorough knowledge of the anatomy of the part to be operated on is essential to scientific surgery; and where deviations from the normal arrangement of the parts are likely to exist, these must be taken into account.

The best time for operating is in clear weather, with an ascending barometer, and with the temperature neither very high nor very low.

Qualifications of the Surgeon.—Every surgeon should aim to be, if not a brilliant, at least a neat and successful operator; and yet the mere use of the knife and other instruments constitutes but a small part of the operative surgeon's duty. It is of much greater importance for him to be a careful and accurate diagnostician, and to have that knowledge of pathology and therapeutics, which will enable him to decide whether an operation should or should not be performed, and, when the operation *is* over, to conduct the after-treatment of the patient in a judicious manner, than merely to be able to do the operation in a given number of seconds, or to shape his incisions in peculiarly graceful curves; in other words, what is technically called *judgment*, is more essential to a surgeon than mere operative skill. The day is happily past when it was thought right for a surgeon to be a mere hand-worker under the direction of another, and it is becoming more and more established as a rule, that no one is justified in operating in any case, unless his own practical knowledge and judgment tell him that in that case the operation should indeed be performed. No one can hope to be a successful operator, who *is* not thoroughly grounded in anatomy; it is rather mortifying, after amputating a thigh, to be unable to find the femoral artery without loosening the torniquet, or to dissect around the neck of the scapula in an attempt to cut into the shoulder joint; yet the surgeon must not in his zeal for the cultivation of anatomy, neglect the other branches of medical science. The importance, and even necessity, of a thorough knowledge of practical anatomy, can, indeed, scarcely be overrated; yet it is more essential for the surgeon to be well versed in pathology and therapeutics (or, in other words, to be an accomplished physician), than it is for him to know the attachments of every muscle in the body, or all the possible variations of arterial distributions.

Circumstances Influencing Results of Operations.—The success of an operation does not, however, by any means, depend altogether upon the skill of the surgeon. Every one must know from his own experience, that during certain periods, or in certain classes of patients, the gravest operations have been followed by favorable results, while among a different set of patients, or at other times, death has seemed almost inevitably to follow even the slightest use of the knife. Various circumstances influence the results of operations.

Age.—The *age* of a patient is a very important point for consideration; children, beyond the earliest period of infancy, as a rule, bear operations well. This is doubtless owing, in some degree, to their freedom from constitutional diseases and from those depressing habits of life which are often acquired with approaching maturity, but is probably also due, in a great measure, to the happy carelessnes and freedom from anxiety which is characteristic of childhood. A child neither looks forward to an operation with dread, nor is oppressed with care for the future, when the operation is over. While an operation may and often must be performed without regard to the age of the patient, the surgeon should, as much as possible, avoid either extreme of life. The new-born infant has less power of recuperation than the older child, while, on the other hand, an operation might be perfectly proper and suitable if performed on a strong and vigorous man in the prime of life, which would be little better than butchery if practiced on one tottering on the verge of the grave.

The *general state of a patient's health* exercises an important influence upon the success of an operation. Hence it is observed that those whose occupation has been of an exhausting or otherwise unhealthy character bear operations worse than those whose lives have been spent under more favorable circumstances. This is one reasen why serious operations, such as amputations, are less successful among the inmates of our large city hospitals (for their patients are usually derived from the least healthy class of inhabitants) than among hearty agriculturists who bring to the operating table a constitution unimpaired by either the diseases or the vices of city life. Hence too, if, before a battle, soldiers have been worn down by long marches and insufficient

food, they will bear the operations, which may be rendered needful by the conflict of the day, worse than if their general condition had been unimpaired by antecedent suffering.

The *condition of particular organs* should be carefully inquired into in estimating the chances of succees after any operation. No one would think of operating, unless for absolute necessity, upon a patient whose lung contained a large tuberculous cavity, or who suffered from serious organic disease of the heart. Our army medical officers can testify to the unfavorable influence upon the results of operations exercised by the chronic diarrhœa and attendant ulceration of the bowels, from which so many of our soldiers perished during the late war, and every practical surgeon knows how slight are the chances of success, after even a comparatively slight operation, in a patient suffering from affections of the urinary organs, and especially from the chronic forms of Bright's disease.

The *temperament* and *idiosyncrasy* of a patient exercise an influence upon the success of operations. Some races, as the Chinese, the individuals of which appear to be of a lymphatic temperament, seem to tolerate operations which among other nations would be extremely fatal. An individual of a cheerful, light, and buoyant disposition has, I think, a better chance of recovery from a given operation than either one who is gloomy and who fears the approach of death, or one who calmly and philosophically makes up his mind to either alternative.

The *hygienic conditions* to which a patient is subjected before, at the time of, and after an operation, exercise a marked influence upon the success or failure of the operation. A man who is half starved is in no condition to undergo a serious operation, nor, on the other hand, is one who habitually overtaxes his digestive powers by too much indulgence in rich and stimulating food, or who exhausts his nervous system by intoxication. Those who have long been exposed to a close and impure atmosphere, or who have constantly inhaled noxious exhalations whether of animal or vegetable origin, are less able to undergo an operation than those who have lived in large and well-ventilated apartments and in a healthy locality. The hygienic surroundings of the patient at the time of operation are also of great importance.

Except in case of necessity, no operation should be done in very hot weather, or during the prevalence of an epidemic, especially of such diseases as erysipelas or hospital gangrene. The room in which an operation is done should be large, well ventilated, and in cold weather well warmed: it should be kept scrupulously clean. The army surgeon must indeed practice his art in cold and rain, or under the full rays of the summer sun; his operations are eminently those of necessity, and must be done under circumstances which he cannot control. But in civil hospitals, and in most instances in private practice, the operator can secure such surroundings as are needful for his patient's welfare. In certain operations, as in those which involve extensive exposure of the abdominal cavity, these external conditions are of extreme importance: no surgeon is justified in performing ovariotomy in a cold, a damp, or a foul room.

After an operation, a patient should be placed in the best possible hygienic conditions. As every operation (except perhaps the very slightest) is followed necessarily by inflammation, what has already been described as the hygenic treatment of the inflammatory process should be immediately adopted. While the digestive powers should not be burdened by the administration of heavy or irritating food, the patient must not be starved, under the impression that such a course can prevent the development of inflammation. I know of no food better adapted to the condition of a patient immediately after an operation than milk, and hence I commonly direct milk diet under such circumstances.

Too much stress cannot be laid upon the importance of free ventilation for a surgical ward; one of the greatest merits of the pavilion system of hospital construction which was so largely adopted during the late war, was the almost impossibility of making pavilions, especially with ridge ventilation, close, as they would invariably have been, had the patients and hospital attendants found it practicable to make them so. There is room for scepticism as to the practical utility of any of the plans for artificial ventilation which have been proposed of late years: it may be doubted whether anything can compensate for the absence of large windows upon both sides of a ward. While the surgeon

would of course not wish to expose his patient to a draught, and would therefore take care not to place a bed immediately beneath an open window, yet it is always better to run the risk of having too much than by any chance to have too little fresh air; I believe with Mr. Erichsen that the "east wind" does more harm indiretly by inducing the closure of doors and windows, than by any deleterious influence which itself possesses.

Not only should over-crowding be avoided in a hospital ward, but the surgeon should adopt means to avoid all sources of zymotic poisoning from contagious emanations, whether gaseous or otherwise. For this purpose the ward should be kept scrupulously clean; all excreta should be removed as soon as possible, and if this cannot be at once done, disinfectants, and especially those containing chlorine or carbolic acid, should be freely used. The ward should contain no unnecessary furniture; there should be no pictures or engravings hung about the walls, and bed-curtains should be strictly forbidden; these all serve as nests to collect any noxious exhalations which may permeate the atmosphere. If any case of erysipelas, pyemia, or hospital gangrene occur in a ward, the affected person should be at once removed to an isolated apartment, or at least separated as widely as possible from other wounded patients; these diseases, if not directly contagious, at least do harm by impairing the quality of the surrounding air.

If sponges be employed, every patient should have his own, and they should be frequently renewed; a pledget of tow forms a good substitute for a sponge, and has the advantage that its cheapness permits it to be thrown away after once using. The lint, or other material employed in dressing wounds, should never be used twice; hence the great importance of finding inexpensive substitutes, as has been ingeniously done at the Pennsylvania Hospital, by Drs. Addinell, Hewson and D. H. Agnew, in introducing paper as a cheap surgical dressing.

It is well for the surgeon to wash his own hands frequently in going from case to case, and he should enforce scrupulous cleanliness on the part of his dressers and nurses; these may seem trivial matters, but it is upon the attention paid to just such things as these that the well-doing of a surgical ward often depends.

Causes of Death after Operation.—A patient may be in a good condition for an operation, the operation itself be most skillfully executed, the hygienic conditions by which the patient is surrounded may be excellent, and yet the apparently best grounded hopes of success may be disappointed by death following the operation, sometimes with great rapidity. There is no subject which has greater claims for the surgeon's consideration than that of the *causes of death after operation.* These causes may, of course, be very various ; but there are some which seem to be so immediately connected with the circumstance of an operation having been performed, as to merit special mention in this place.

Shock.—A patient may die from the direct *shock* of the operation. As has been explained more fully when speaking of shock as one of the constitutional effects of external violence, vol. 1, p. 614, there is a positive physical affection known as *shock*, to be distinguished from the mental emotion and perturbation which sometimes receives the same name. Hence it is erroneous to say, as is often done, that the occurrence of shock is prevented by the use of anæsthetics: the sensation of pain is indeed done away with, and much of the mental anxiety which was formerly the cause of intense agony before and during an operation* is no doubt avoided; but there is a powerful cause of positive physical depression which, in some degree, attends every operation. A patient may come to the operating table in a perfectly composed and even cheerful frame of mind, remain in a state of complete anæsthesia during the whole operation, and yet, without any great loss of blood or other obvious cause, die within a few hours after its termination, from a purely physical condition of *shock.*

The shock of some operations is much greater than that of others: thus a large amputation, as through the thigh or at the hip joint, is attended with more shock than one through the leg or arm; the removal of a tumor in the immediate proximity

* A most vivid and painful description of the suffering under amputation before the days of anæsthesia, may be found in a letter from Prof. Wilson to Sir J. Y. Simpson (*Obstet. Mem. and Contrib.*, vol. ii, and *Acupressure*, p. 566).

f the base of the scull, is attended with more shock than the taking away of a much larger mass from another part of the body; and there is sometimes observed in the comparatively slight operation of castration, a marked failure of the pulse at the moment of dividing the spermatic cord. The treatment of shock, after an operation, is to be conducted by keeping the patient as quiet as possible, in a recumbent position, and placing hot bricks, or bottles filled with hot water under the bedclothes, so as to produce an equable warmth of temperature, and the use of *Camphor*, *Arnica*, *Ammonia*, or other remedies as recommended in the treatment of Shock, vol. 1, p. 616, until reaction shall have taken place. In hospitals, metallic foot-warmers are usually provided, and should always be kept in readiness. While the body is to be kept warm, free access of air to the lungs must be secured by opening the windows, if necessary, and even by fanning. As soon as reaction has taken place, *Aconite* should be given to moderate the excitement, and the case treated afterwards according to circumstances.

The older writers described what they called "*secondary or insidious shock*," which might come on subsequently to or independently of the occurrence of the primary form. This, which is the most fatal variety of shock, is developed at an interval of from several hours to one, two, or more days after an operation; it is, in most if not in all cases, dependent on the formation of heart clots,* which may cause death by directly embarrassing the action of that organ, or more remotely by fragments becoming detached and plugging the arteries of the brain or lungs, a fatal result being thus caused by the process known as *embolism*. Either primary shock or great loss of blood would, by diminishing the force of the circulation, tend to increase the risk of this formation of heart clots.

Hemorrhage at the time of or subsequent to an operation is very often the cause of death; nothing can be more erroneous than to assert, as is sometimes done, that a moderate loss of

* Fayrer has particularly insisted upon the frequency of death after operations from the formation of fibrinous coagula in the right side of the heart, and believes that a malarious state of the blood acts as a predisposing cause of such coagulation.

blood during an operation is beneficial to the patient. Every drop of blood is valuable; there can be no question that there is no surer way of making an operation unsuccessful, than to neglect even apparently slight hemorrhage. The absolute *amount* of blood lost during an operation is not so immediately the cause of danger as the *rapidity* with which the bleeding occurs. Thus an amputation at the hip joint, in which one or at most two or three jets from the femoral artery, together with the shock of the operation, produced a state of collapse from which the patient never rallied; a much larger quantity of blood has been lost in other operations, where the flow was more gradual, and in which the resulting depression was scarcely perceptible. *Intermediate* or *intermediary hemorrhage*, as it is sometimes called, is apt to occur when the patient begins to react from the state of anæsthesia, and after he has become warm in bed, from vessels having escaped the surgeon's notice when the force of the circulation was depressed; hence, if there has been much shock, or if the operator has been unable to detect the mouths of vessels which yet he knows must have been divided, it is well to postpone the final closure of the wound until after *complete reaction*. *Secondary hemorrhage* may come on at any period between the occurrence of reaction and the ultimate healing of the wound; it may result from the premature detachment of ligatures, either from their having been in the first place insecurely applied or from subsequent inflammatory changes in the coats of the vessels, or it may be due to the occurrence of sloughing, opening vessels which had not been divided, or at a part higher than the point of ligation.

A patient may die after an operation, from the violence of the *inflammation* or the accompanying *traumatic fever* which, except in slight cases, necessarily ensues. The symptoms and treatment of these conditions have been sufficiently discussed in vol. 1, p. 194, *et sequitur*.

A patient may die after an operation from *causes previously in existence* which the operation has not been able to remove, or which it has unavoidably aggravated; as an instance of the former contingency, I may refer to the deaths from hectic and suppurative exhaustion which follow excisions of joints; of the lat-

ter, death from pre-existing peritonitis after the operation of herniotomy.

Finally, patients after operation are frequently carried off by various affections, which, while not necessarily dependent on the performance of an operation, yet follow the use of the knife with sufficient frequency to entitle us to consider the operation as their exciting cause. These are chiefly *erysipelas*, *pyemia*, *hospital gangrene*, *diffuse inflammation of the areolar tissue*, and, more rarely, *tetanus ;* these have been referred to in their proper places, and are mentioned now merely to complete this view of the subject. An operation wound, as any other wound, may become the seat of *diphtheritcc deposit*, accompanied by low constitutional symptoms, and must be treated on the same principles which guide the practitioner in treating a case of diphtheria occurring under other circumstances.

Preparation of Patients for Operation.—In view of the great dangers which are thus seen to accompany every operation, it certainly behooves the surgeon, whenever it is practicable to do so, to take measures as far as possible to avoid those dangers; and hence the importance of attending to the *preparation of a patient for operation.*

In many cases, unfortunately, there is but little time offered for preparation; a patient with a severe compound fracture requiring immediate amputation, or one who is suffocating with pseudo-membraneous croup, cannot wait for any course of preparatory treatment, but must take the chance, if an operation be deemed proper, without regard to the state of his general health; yet even under the most unfavorable circumstances, the *morale* of the patient may often be improved by a few soothing and encouraging words, while, if there be much physical depression, a warming and stimulating draught may suffice to render him better able to submit to the ordeal of the knife than he would be otherwise.

Consent of Patient.—A very important question, and one which admits of grave doubt, is as to how far a surgeon may be justified in assuming the responsibility of operating, when a patient is unwilling to give his assent. Of course no one would think of performing any operation of *complaisance* without the

full consent of the patient, but where an operation is immediately necessary to save life, as in a case of strangulated hernia or of injury requiring primary amputation, the surgeon's position is one of great perplexity.

If the patient be a child, the consent of the parents is quite sufficient; if an adult, but unable from intoxication or other cause to judge for himself, the consent of a near relation or friend who is competent to decide the matter should be obtained; in the absence of the parents or other relatives, the surgeon must place himself as it were *in loco parentis*, and do fearlessly what he thinks best for his patient. If, however, an adult in full possession of his faculties refuse an operation, or if, in the case of a child, the parents refuse for him, I cannot think it the duty of the surgeon to persist in operating under such circumstances; he should remember that spontaneous recoveries do occasionally occur in the most unpromising cases, and that, on the other hand, death may very likely follow the most eligible and best executed operation; and when the true state of the case and the imperative necessity (humanly speaking) of the operation have been clearly and fully explained, I cannot think that the surgeon should be held responsible for the consequences of obstinate refusal on the part of the patient or his friends.

Preparatory Treatment.—The requisite consent having been obtained, in any case that admits of a short delay, it will be desirable to occupy a few days in preparatory treatment. The diet should be regulated, such articles as are known to be irritating and difficult of digestion being avoided, while the intestinal and other secretions are brought into a healthy condition by the use of appropriate remedies. In the case of hospital patients, who are often brought from a considerable distance to undergo an operation, is is proper to wait until they have rested from the fatigues of traveling, and have become somewhat accustomed to their new quarters and the new faces that surround them; as they are frequently in a state of debility, it is often essential to place them in the most favorable state for operation.

In the case of a woman, the operation should not be done during a menstrual period or during pregnancy, if the exigencies of the case admit of postponement. The patient should

clad, and if much bleeding be anticipated, should wear an additional garment which can be removed after the operation. No solid food should be given, if an anæsthetic is to be used, for several hours previous to its administration. All preliminary arrangements should, if possible, be completed before the anæsthetic is given, as there can be no doubt that prolonged anæsthesia exercises an unfavorable influence upon the success of an operation. The rule upon this point must, however, vary with the individual case; thus if an operation on a woman will necessitate exposure of the person, it is obviously better that the anæsthetic should be administered before the patient is removed from her bed, and that the final arrangements should be postponed until she has become unconscious. If the rectum or adjoining parts are to be involved in the operation, the bowels should be unloaded the evening before, or an enema be given a few hours anterior to beginning the operative procedure.

Preliminary Arrangements.—The surgeon should himself see that the patient is in good condition for the operation, and that all necessary preparations have been made: the operating table should be firm and solid, of a height sufficient to prevent the necessity of the surgeon's being fatigued by stooping, and surmounted by a thin mattress covered with oil-cloth and a clean sheet, or by folded blankets; it should be placed in a good light (a northern exposure is usually considered the best), and should be provided with pillows, and additional coverings to throw over the patient. The best hour for an operation, in this region of country, is from 11 A. M. to noon; if it be a dull day, or if the operation be unavoidably performed in the afternoon or evening, the surgeon must see that proper arrangements have been made for providing artificial light. The necessary instruments should be carefully arranged in the order in which they are to be employed, placed in a suitable tray, and covered with a clean towel until the time has come to use them; it is a good rule to think over beforehand all the steps of the operation and the possible contingencies that may arise, and provide the proper instruments accordingly. The surgeon must instruct each of his assistats as to the duties he is expected to perform, and each assistant should, as far as possible, confine himself to his own duties and

not interfere with those of the rest. For most operations two or three assistants are sufficient, and few can require more than five or at most six. One should take charge of the anæsthetic; another hand the instruments; a third support the part to be operated on; a fourth be ready to suppress hemorrhage, etc. All the needful dressings, sponges, basins, bandages, etc., should be arranged where they can be readily reached. Having seen to all these preliminaries (the patient being in position, anæsthetized, and the part to be operated on divested of superfluous hair and clothing), the surgeon is ready to begin the operation. It may seem almost superfluous to say that on such an occasion the surgeon's personal demeanor should be quiet and dignified; eccentricities of costume and conduct should be avoided, the perfection of an operation consisting greatly in the simplicity of its concomitant circumstances. Though the operator and his assistants may, from natural disposition or from long habit, have come to look upon an operation as an every-day affair, it must be remembered that to the patient and his friends it is an occasion fraught with the deepest interest and the most anxious solicitude; hence, both for his own reputation and out of regard to the feelings of others, the surgeon should repress manifestations of excitement, and still more of levity.

Operation.—The steps of an operation should all be planned in advance, and the less talking that is done after the knife has been once taken in hand, the better. Time is not quite so important now as it was before the days of anæsthesia, but it is certainly not good for the patient that the surgeon should be obliged to stop and hold a consultation at each stage of the operation. The incisions should be made as much as possible in the lines of the natural depressions of the part, so that they will come together without undue tension or deformity; they should be sufficiently free, and made with a firm pressure, sufficient to carry the knife through the skin and superficial fascia at the first incision. Hemorrhage during an operation should be preventd by the use of a tourniquet or the pressure of an assistant's fingers; it is even sometimes desirable to pause and secure each artery as it is divided. When the operation is completed and all oozing of blood checked (which may be facilitated, after tying the ve-

by exposing the wound for a short time to the air, or by pouring over it a stream of cold water or of diluted alcohol), the edges of the incisions should be brought together with sutures. This is best done while the patient is still in a state of anæsthesia, though if there have been much shock or hemorrhage, it should be deferred until reaction has taken place. The sutures may be made of ligature silk, of ordinary thread, or of metal. The lead suture is, I think, preferable for most cases, as it will not bear a very great strain, and thus acts as a kind of safety-valve against undue tension. In other cases, and especially in certain plastic operations, silver or unoxidizable iron wire forms a better material than lead, and when very close approximation is required, the harelip pin may by employed in preference to other forms of suture.

If the wound is extensive, it may be necessary to give additional support by means of adhesive plaster. Narrow strips should be used, to be applied between the points of suture, and to extend some distance on either side of the incision. The wound should then be lightly dressed, and the patient placed in a clean bed, which should be at hand and already warmed. The after-treatment must be conducted upon the principles already laid down, and emergencies met by appropriate remedies.

The surgeon should not, if practicable, leave his patient until he has seen him comfortably fixed in bed, till complete reaction has occurred, and till he is satisfied that no risk of bleeding is to be anticipated. He should also see that a competent nurse is in attendance, to whom he should give full and explicit directions as to the management of the patient in the intervals between his visits.

Temperature of room.—The temperature of the room must be carefully regulated. No capital operation can be safely performed in any place where the mercury is below 65 deg. Fahrenheit, especially when large joints or other cavities are opened into. This is a matter which is often neglected, to the great disadvantage of patients.

Appliances.—Besides the instruments, an abundant supply of ligatures, or acupressure needles and wires, suture-needles properly threaded, adhesive plaster cut into strips, lint, styptics, one or two tourniquets, a door-key, with its handle well wrapped, should

be placed in readiness. Well-boiled sponges, soft but of firm texture, about half as large as the closed fist, are invaluable in all surgical operations.

The part to be operated on should always be shaved, if hairy.

Anæsthesia.—The anæsthetics in general use at present are sulphuric ether, chloroform, and nitrous oxide. Ether is the safest; but sometimes we have to use chloroform, as in operations about the face, when the actual cautery must be applied, or at night, when artificial lights are needed, and the ether might take fire. The author's plan is to use one-third part of chloroform and two-thirds of ether by weight, and administer slowly and cautiously, until the full effect of the anæsthetic is produced, With this mixture no serious effects have happened in his hands. Nitrous oxide can only be effectively employed when the operation is one which occupies but a few seconds, such as the extraction of teeth.

When ether is given, the great object is to have the patient inhale its vapor, without any admixture of atmospheric air. Hence the best plan is to use a cone of sufficient size, made of a stiff towel, or of sponge cut into suitable shape. The desideratum is surface for evaporation. The cone may be about eight inches in height, and wide enough at its base to cover the nose and mouth. A small quantity of ether is dashed into it, and it is immediately applied over the patient's face, the head being held steady between the hands, while the thumbs keep the cone in position. The struggles of the patient must be restrained by assistants. Fresh ether must be dashed into the cone from time to time.

For the reduction of dislocations, for the opening of abscesses, or for almost any operation which requires but a very short time, we may take advantage of the earliest insensibility, which comes on a very few minutes after inhalation, and soon gives way to the stage of excitement.

In giving chloroform, the danger is much lessened by allowing some air to enter the lungs along with it. A very good method is to lay a single thickness of thin stuff, such as an old pocket-handkerchief, over the mouth and nose of the patient, and then to let the chloroform fall on this drop by drop, quickly fr

bottle. The nostrils and lips must be previously greased to prevent irritation.

Nitrous oxide is usually given, in cities, by persons who are in the habit of using it for dental operations. As a special apparatus is required, it can scarcely come into general use in any but large towns.

Local anæsthesia, by ether spray or by freezing mixtures, has not answered the expectations of its advocates, except for very small operations. See Local Anæsthesia, vol. 1, p. 143.

Incisions.—There are various modes of making incisions, according to the nature of the operation to be done, and especially according to the thickness of the skin or other tissue divided, and the anatomy of the underlying structures.

The knife may be held like a fiddle-bow, or like a pen, as is seen on p. 153, vol. 1, showing the various positions in which the scalpel should be used in surgical operations. It may be made to cut from within outward, or be pushed through the tissues, and then made to cut its way out, or from within outward. When important structures lie just beneath the skin, this latter may be pinched up, and cut in either of the ways just mentioned: from without inward, as in Fig. 2; from within outward, as in Fig. 4.

Often it is of advantage to use the left hand, to put on the stretch the portion of skin about to be divided, as in Fig. 3.

When, as in operations for strangulated hernia, or for the ligation of arteries, successive layers of tissues must be divided, it is best to pinch up each layer with forceps, nick it, and then to push under it a grooved director, along which, its back downward, as in Fig. 8, the knife can be safely insinuated.

Sometimes the director is not necessary; the layers being simply pinched up with forceps, put on the stretch, and divided, as in Fig. 5.

Different forms of incisions may be made, according to circumstances. When one flap only need be turned up, it may be marked out by a V-shaped cut. Two flaps may be made by a T-shaped cut, and a rectangular flap by three lines, or two rectangular flaps by three incisions making an H. By means of two cuts crossing one another at right angles, four flaps may be turned up,

so as to expose the deeper structures. A semilunar incision will sometimes answer very well, giving a good deal of room, and being easily closed; this may sometimes be repeated so as to make an S, or an elliptical portion of skin may be taken out.

Sometimes two incisions are to be made. In that case it is almost always better to make the lower one first, so that the flow of blood from the upper one may not interfere with it.

Control of Hemorrhage.—When copious hemorrhage occurs upon the division of the skin, if the blood is bright red, and jets out with each pulsation of the heart, the wounded vessel is an artery, and should be tied. But if the blood is dark, and wells out continuously, it comes from a vein, and will probably cease in a few moments. Should general oozing occur from a wounded surface, it may be exposed to the air, or washed either with cold water, alcohol, or some stronger styptic. Or a piece of ice may be rubbed over it.

Prevention of Hemorrhage.—Before beginning any operation likely to be attended with hemorrhage, the flow of blood to the part must be in some way controlled. If the part concerned is in the trunk, pressure with the fingers of an assistant may be resorted to; if in an extremity, some ferm of tourniquet or arterial compressor may be employed, as shown in vol. 1, page 158, on the "Means of arresting Hemorrhage."

Closure of wounds after operations.—For the closure of wounds, there are various plans. The glover's, or continuous suture, is now not much used. In some operations, where we want to insure union between the deeper structures, the quilled suture is better than any other. This is made by passing double threads through the edges of the wound, with an ordinary needle; a small roll of lint, a quill, or a bit of bougie, is now passed through the loops on one side, and another placed between the double row of ends on the other side; and by tying these ends as firmly as may be required, we bring the quills toward one another, and press the edges of the wound together. Ordinarily, however, we use either the interrupted suture, or the harelip suture, with pins such as are seen in vol. 1, page 169.

In making the harelip suture, the pins are pushed through both lips of the wound, about a quarter of an inch from their edge

All the pins being in place, a piece of silken or hempen thread is passed in figure-of-8 turns around each pin, so as to crowd the cut edges together. When the suture is completed, the sharp points of the pins are nipped off with the cutting pliers; the skin is then protected from injury from the pressure of the pins, by putting a strip of adhesive plaster under each row of ends.

In order to pass the suture needles readily, the forceps, as devised by the late Dr. Physick, may be used; the needle being grasped, the catch on the handle is secured, so as to make but one instrument of the needle and forceps.

A plan of much value in making the interrupted suture with metallic wire, is to employ a needle with an eye near the point, set in a handle or grasped in forceps. Pushing this needle through both lips of the wound, the tip of the wire is passed through the eye of the needle, and pulling the latter back, it draws the wire after it. By this method we entirely avoid the kinking of the wire which is apt to take place when common needles are used.

One of the usual shapes of suture needles for silken or hempen thread is shown in vol. 1, Fig. 9, p. 65; another form, curved only near the point, may be also seen. It is always necessary that these needles should not only be sharp at their points, but should have a cutting edge at either side, extending as far as their broadest part; otherwise they will not readily make their way through the skin.

Arrest of Hemorrhage.—Mention has already been made of the controlling of hemorrhage by the tourniquet, the Spanish windlass, etc. After an operation (such as the removal of a limb) is over, we must make some arrangement for the permanent prevention of bleeding; and the plan generally adopted is to tie the vessels which have been divided. In order to do this, we draw them out and isolate them, either with a tenaculum or hook, or with a pair of forceps; the forceps should either close with a spring, Fig. 337, or have a slide to hold the blades together, as seen in Fig. 338.

In whatever way the artery is isolated, its ligation is effected by tying tightly around it a thread of saddler's silk, or of hemp, so as to thoroughly occlude it. Some surgeons, and especially Mr.

Fig. 337.

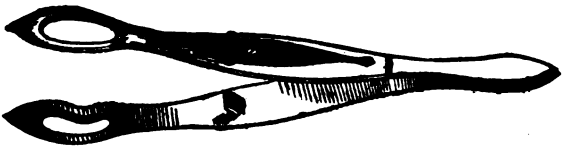
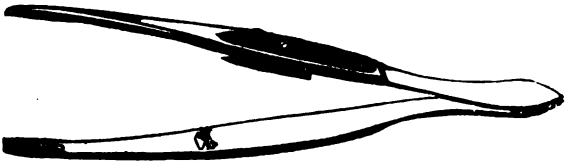


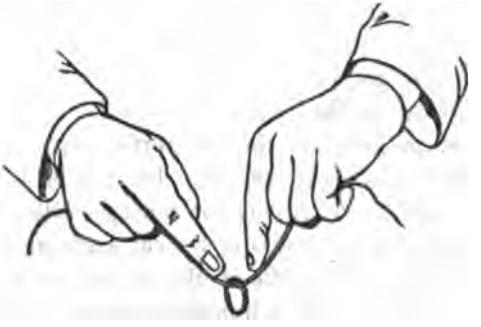
Fig. 338.



Lister, of Edinburgh, steep their ligatures in a strong solution of carbolic acid, thinking that the antiseptic properties of this substance lessen the risk of pyemia.

An ordinary flat double knot is tied in the thread, and one end is cut off short; in large amputations, it is better to leave both ends of the ligature on the main artery, knotting them together so that it may be distinguished from those on the smaller vessels. The mode of tying the knot, especially where the vessel lies deeply, by pushing it down with the fingers, is shown in Fig. 339.

Fig. 339.



As the effect of the ligature applied in this class of cases, is the same as where an artery is cut down upon and tied, it may

not be out of place to describe it here once for all. The inner and middle coats of the vessel are cut across by the pressure, wrinkled up and contracted. A clot forms between the seat of compression and the nearest branch given off between it and the heart. The artery shrinks and becomes a mere fibrous cord at the part ligated.

When an artery is tied in its course, the part to which it conveys blood would become gangrenous if it were not that other channels take the place of that which is closed; or, in surgical phrase, the collateral circulation becomes established. Thus the femoral artery has been tied for a popliteal aneurism. All the branches which arise from the femoral above the point of ligation are enlarged and tortuous, and carry to the popliteal, at and below the point at which it becomes pervious, the blood which is needed for the leg and foot.

Another plan for occluding vessels after operation or injury, is that of acupressure, proposed by Prof. Sir J. Y. Simpson, of Edinburgh. There are four ways of doing this. 1. In the case, for example, of amputation of the thigh, a long needle is entered through the skin of the flap containing the femoral artery, and brought out on the cut surface; then, by depressing the head of the needle, it is made to bridge over the vessel, passed back into the cut surface, and brought out again externally; thus exerting a pressure against the vessels like that which we make when we apply a pin so as to keep the stalk of a flower against the lapel of the coat. 2. A common sewing needle, threaded with fine iron wire, is passed into the cut surface at one side of the vessel, and at a little distance from it; it is made to dip into the tissues so as to get something of a hold on them, and is then brought out close to the vessel, made to bridge it across with some pressure, pushed into the cut surface again, and again brought out, still on the cut surface. The wire is for the withdrawal of the needle. 3. A common sewing needle, threaded as before, is passed into the tissues of the cut surface, and brought out again, so that the middle of the buried part is close to the artery. Now a loop of fine iron wire is slipped over the tip of the needle, carried across the vessel just above its open mouth, pulled tight enough to close it, and secured either by tying or

twisting around the other portion of the needle. In about forty-eight hours, the wire attached to the needle, which should be twisted so as to mark it, may be pulled upon and the needle withdrawn, when the other or looped wire will of course be free. 4. The needle, threaded as before, is thrust through the vessel, turned around so as to twist the vessel on itself, and then pushed into the tissues so as to engage it, and prevent its rotating back again. Of these four methods, which may be readily understood by practising them on the dead body by the directions just given, the third is the one which has found the most general favor. The pressure by either may be removed in from forty-eight to seventy-two hours.*

Still another method of securing a divided artery is that by twisting or torsion. This is generally done by means of two pair of forceps; with one the artery, drawn out to about one-eighth or one-quarter of an inch from the surrounding tissues, is caught close to the latter, while with the other pair the free end is seized and rotated so as to twist it up and bring its sides into close contact.

This method, although it has been applied to large vessels, and successfully, is not so safe as either ligation or acupressure. We may often, however, permanently check the flow of blood from small arteries by just catching them as they spring and giving them a sharp twist: occasionally the same object is gained by mere pinching. The danger in either plan is, that after the wound is dressed and the patient put to bed, the circulation becoming more active, the blood may again flow in such quantity as at least to interfere with the healing.

---

*Full descriptions of these methods, with illustrative cuts, may be found in the works on Acupressure, published by Sir J. Y. Simpson, and by Pirrie and Keith.

CHAPTER II.

OPERATIONS ON HEAD AND NECK.

SECTION I.

TREPHINING.

The operation of trephining is sometimes called for in fractures of the skull, when a portion of the bone is depressed, and the symptoms indicate that there is pressure made upon the brain-substance. (The symptoms of *compression*,—coma, or convulsions, or both, with irregularity of the pupils, etc., are fully described under their proper headings.) Occasionally it has been done to give exit to blood or pus effused within the cranium, and it is sometimes resorted to in cases of old injury, or of disease, as epilepsy; but is unjustifiable unless the point of pressure can be clearly made out.

Surgical Anatomy.—The vault of the cranium is composed of flat bones, united by sutures, and consisting of two tables, an outer and inner; between these tables is a cancellous layer, amply supplied with veins, and called the diploe. In young persons this diploe can hardly be distinguished.

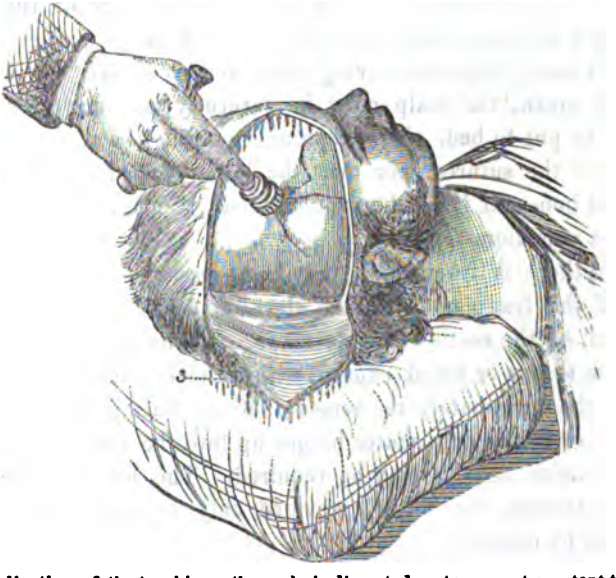
There are certain regions in which, from the large blood-vessels that exist within the skull, the operation of trephining is more dangerous than elsewhere. Along the median line, from before backward, runs the great longitudinal sinus, carrying venous blood. From the occipital protuberance, at the back of the head runs the lateral sinus, also carrying venous blood, and going to empty into the internal jugular vein. The anterior branch of of the middle meningeal artery; its posterior branch; and the surface of the dura mater, are all matters of interest to the surgeon in the successful performance of this operation.

Operation.—The apparatus requisite for this operation comprises a large and small trephine, a straight and curved Hey's saw, and an elevator—beside a good scalpel, and the other instru-

ments which every surgeon is supposed to have in his pocket. There are four cases which may require this operation. 1. Fracture of the skull with depression of bone. Extravasation of blood under the skull. 3. Suppuration of the dura mater. And, lastly, occasional cases of epilepsy arising from the irritation of a diseased spot of the skull. For the first and last cases, the trephine should be quite small, so as not to sacrifice more bone than is absolutely necessary.

Supposing it to be a case of depressed fracture. In the first place the head is to be cleanly shaved, the bone, if not already laid bare by a scalp wound, must be exposed by an incision in the shape of a V, or H, or T. Then, perhaps, some loose fragments may be picked out, or a projecting point may be cut off with a Hey's saw, or with bone forceps, that will enable the

Fig. 340.



The application of the trephine; the scalp is dissected up to a greater extent than is necessary for the operation to show the fissured bone.

surgeon to raise the depressed portion. But if this cannot be done, a circular piece, consisting of the edge of the depressed bone, and of the adjoining bone under which it has been wedged, must be removed. The pericranium being raised up from the part which is to be perforated, the surgeon

applies the trephine, and works it with an alternate pronation and supination of the wrist, and when it has made a circular groove deep enough to work in steadily, he takes care to withdraw the centre pin. He saws on steadily and cautiously, pausing frequently and examining the groove with a probe or quill, to ascertain whether it has reached the dura mater, and when it has, he introduces the elevator to raise the circular piece of bone. He must be particularly careful to fix the centre pin, and the greater part of the circumference of the instrument on firm bone—and by no means to press heavily, whilst sawing, on any piece that is loose or yielding. The saw will be known to have reached the diploe by the escape of blood with the bone dust; but it must be recollected that the diploe exists neither in children nor in the aged. When the piece of bone is removed, the surgeon must gently insinuate the point of the elevator under that which is driven in, and using his finger, or the edge of the firm bone as a fulcrum, must carefully raise it to its proper level. Then all loose fragments having been removed, and the wound sponged clean, the scalp must be carefully laid down, and the patient be put to bed. The trephine should not be applied in the course of the sutures, nor over the lower part of the frontal or occipital bones, if it can be avoided; but, if necessary, there is no great objection.

When there is fracture, it may be necessary to pry up one or more of the fragments with the elevator, or to extract a piece loosened by the section already made. If the compression has been due to pus or blood effused within the cranial cavity, outside of the dura mater, the removal of the button of bone may suffice; or if the dura mater bulges up into the trephine-hole, a small incision into it may be required. The less interference with the tissues, the better, provided only that the pressure on the brain be relieved.

Any vessels that spring may be tied, or pinched in a pair of forceps, or twisted.

In closing the wound, it is better as a general rule to employ adhesive strips, and to avoid the use of sutures, since erysipelas is readily excited by irritation of the scalp. The part must then be treated as recommended for Incised Wounds, vol. 1, p. 325.

Paracentesis Capitis, or puncture of the head, is an operation that has been resorted to in hopeless cases of hydrocephalus in children. It consists in introducing a very fine trocar or grooved needle perpendicularly to the surface, through the anterior fontanel, as far as possible from the longitudinal sinus. When two or three ounces of fluid have escaped, the puncture should be carefully closed, and moderate support be applied to the head by bandages. If the child becomes faint, it must be kept in the recumbent posture, and a few doses of *Arnica* or *Camphor* be given. The operation may be repeated at intervals of two or three weeks.

SECTION II.

OPERATIONS UPON THE EYE AND ITS APPENDAGES.*

For operations upon the eyelids and parts outside the eyeball the patient is usually placed in a state of anæsthesia; in cases of children, indeed, this is often indispensable, since their crying and struggles, and the strong contraction of the orbicular muscle, would otherwise render the surgeon's procedures not only difficult but uncertain.

As in nearly all operations on the face, the position of the patient may vary. He may sit in a chair, his head resting either against the breast of the surgeon standing behind him, or against that of an assistant, the surgeon sitting or standing in front. Or he may lie on a firm bed or table, his head on a pillow, and the surgeon standing either at the back of the head or at the side of the bed or table. If the surgeon is equally expert with eitheir hand, he can operate on both eyes, whether from above or in front, without changing position; but if he uses his right hand

---

*A few only of the more important operations of the eye and its appendages which occur in every-day practice, are given in this chapter. For a more full and complete description of the various affections of this organ the reader is referred to the excellent treatises written upon this subject, and among them stands prominently before the profession the valuable work of Dr. Angell, of Boston, Mass., who has given years of study and research in acquiring a thorough knowledge of this important specialty and the treatment of the various diseases incident thereto.

mainly, he will operate on the right eye from above, and on the left from in front.

In doing plastic operations on the lids, the surgeon generally faces the patient, whether the latter is lying down or sitting up, since he can judge better as to the effect of what he does.

§ 1—FOREIGN BODIES.

When a patient complains of a foreign body in the eye, the surgeon should first examine the cornea; then the inside of the lower eyelid and lower part of the globe, by everting the lid, and telling the patient to look up. If nothing is discovered there, the patient should turn the eye downward, so as to expose the upper part of the globe, and the surgeon should turn the upper eyelid inside out, which may easily be done by taking the eyelashes between the finger and thumb, and turning the lid upwards over a probe If any substance stick in the cornea, so that it cannot be removed by a probe, or silver tooth-pick, or fine forceps, the point of a cataract needle or lancet should be carefully passed under it so as to lift it out. A still more effective instrument is a sort of delicate scoop or gouge, introduced by Haynes Walton; for foreign bodies, when sharp and angular, and particles of hot iron, often become so imbedded in the cornea that they must be scooped out. Perfect rest to the eye should be enjoined, and every other means be taken to obviate inflammation. To remove particles of lime or mortar, the lids should be everted, and the eye be well syringed or sponged with weak *Calendula* water, or with oil, or with pure water if neither be at hand. For injuries with acids or alkalies, ablution or syringing with water is the readiest remedy. We may observe that whenever there is an inflammation of the conjunctiva, with a fair probability that it may have been caused by the intrusion of a foreign body, the strictest and most accurate search should be made; because an eye might be lost, or the patient subjected to weeks of illness, and of ineffectual treatment, if it were allowed to remain. Whenever a foreign substance has passed within the anterior chamber, if it can be seen and readily seized, it is better to extract it at once, if the surgeon possess the requisite skill and instruments, which are those required for the extraction of cata-

ract. Mr. Bowman finds a drop of castor-oil the most soothing application in those very painful cases in which the epithelium has been scratched or roughly stripped off from the surface of the cornea.

§ 2.—OPERATIONS UPON THE EYELIDS.

Surgical Anatomy.—Each eyelid contains a plate of fibro-cartilage, covered externally by skin, internally by mucous membrane continuous with the conjunctiva. Between these tarsal or palpebral cartilages and the skin is a muscular layer, the orbicularis palpebrarum, which by its contraction closes the lids. The cartilage of the upper lid has attached to its upper edge a muscle, the levator palpebræ, which draws it up and opens the eye.

At the edge of each lid is a row of follicles from which spring the eyelashes, and behind the cartilage, between it and the conjunctiva, is a corresponding row of tubular sebaceous glands, called Meibomian.

Between the cartilages and the orbicularis muscle there is a fibrous layer, the tarsal ligament, attaching the outer margin of the cartilages to the rim of the orbit. This membrane is particularly strong externally, where it is called the external tarsal ligament, and internally, where it is called the tendo-oculi.

Removal of Tumors.—Small rounded encysted or fibrous tumors are not uncommon in the subcutaneous or submucous tissue of the lids. When under the skin, they may be excised, by means of a forceps and scalpel, the incision being made of sufficient size to admit of easy removal. The lid is fixed by grasping it steadily in the forceps of Desmarres, the solid blade being passed behind it, and the fenestrated one in front, surrounding and making prominent the tumor; which is then dissected away with a delicate scalpel and forceps, the incisions being made *along* the lid. Another form of these forceps, devised by Snellen, are more convenient, because the edge of the lid is left free; the blades are set at an angle, so that they may be used for the right or left eye.

A convenient mode of dealing with these tumors, when seated under the mucous lining of the lid, is to let an assistant evert the

lid over the slender handle of an eye-instrument and hold it tense with the Desmarres' bifurcated forceps while the surgeon then uses a fine forceps and bistoury to remove the tumor.

Warts, enlarged cutaneous follicles, and vascular tumors, or *nævi*, are to be treated the same here as elsewhere. Cysts of hydatids may grow beneath the loose fold of conjunctiva which passes from the inside of the eyelid to the surface of the eyeball. If that fold be divided longitudinally, the hydatid will escape, or may be extracted by a hook or forceps. There is one small tumor found here, and called, *par excellence*, the *tarsal tumor*, the true nature of which is thus explained. It consists of one of the acini of the Meibomian follicles, filled by thick sebaceous matter. If it projects on the inner surface of the lid, it is readily recognized as a small darkish speck, which may ulcerate and discharge its contents. If it chance to project on the outer surface of the so-called tarsal cartilage (for it must be observed that the Meibomian follicles are not, as is usually said, on the inner surface of the cartilage, but are contained within its very substance), then the obstructed follicle, having no means of emptying itself, forms a small tumor, which increases by the addition of fibro-plastic matter to its exterior. Such tumors may be felt under the skin and orbicularis, attached to the outer surface of the tarsal cartilage. On everting the lid, a slight depression is noticed within. A sufficiently free puncture should be made from within the lid, the cyst broken up with a probe, and the sebaceous and epithelial contents be evacuated.

The instrument invented by Desmarres will be found very useful in removing tumors from the eyelid as it has the double advantage of fixing the lid and of preventing the flow of blood which often interferes greatly with the operation. It consists of a forceps, one blade of which ends in an oval-shaped flat plate, and the other in a ring; a screw is adjusted to the instrument, by which the ring can be made to press down upon the plate. In using the instrument, the flat plate is introduced under the eyelid, or as much of it as is deemed necessary, the skin being carefully stretched, and then by means of the screw the ring is made to exercise sufficient compression around the tumor to prevent the blood from reaching the parts into which the incisions are to be made.

Ectropion, or eversion, is usually met with in the lower lid, in reference to which the operations for it are therefore generally described; but the same procedures, with but slight modifications, are suitable for the upper.

Fig. 341.

The operation of Weller, a very simple one, is shown in Fig. 341. An assistant everting completely the lower lid, the surgeon lays bare the cartilage by an incision through the mucous membrane and drawing it out with forceps, 1, snips away a portion of it with fine scissors, 2.

When the lid is adherent to the ball (*symblepharon*) to a very small extent, it may sometimes be dissected away, and prevented from becoming again attached by keeping a small silver plate interposed until the healing is complete. Or, as advised by Von Ammon a V-shaped incision may be made around the adhesion; the edges are then brought together, and united by a fine harelip suture including the whole thickness of the lid, as in Fig. 342.

Fig. 342.

Fig. 343.

Sometimes, after injury or the removal of a tumor, there is a loss of substance in the skin of the lower eyelid, causing ectropion. To remedy this, Dieffenbach advised making an incision through the skin outward from 2 to 4 (Fig. 343,) and another downward and inward from 4 to 5; the flap thus defined being then loosened from the tissues beneath, may be shifted over so that the edge 3—2 shall correspond to 3—1, and fastened thus by sutures.

Another mode of transplantation is that of Wharton Jones. A triangular flap of suitable size is marked out by incisions

through the skin of the cheek just below the spot to be covered; the surface of the latter is then freshened, the flap, when partially dissected from the subjacent tissues, especially toward its apex, is by gentle traction brought up into the desired position, and secured by a sufficient number of points of suture. Finally, the edges of the gap left below are approximated by harelip sutures, as in plastic operations.

When the ectropion is due to a cicatrix in the skin of the lower lid, Dieffenbach's plan may be followed. He included the cicatrix in a triangular incision, the base of the triangle above, the apex below. Then, extending the base-line either way, he brought the sides together by sutures: thus closing the wound, freeing the skin above, and pushing the lid into place.

When a portion of the upper lid is lost, as by injury, it may be necessary to make it up by transplanting a flap of skin from the outer side of the orbit.

Epicanthis is the name given to a crescentic fold of skin sometimes present in children, covering the inner canthus. If it does not disappear with the full development of the nose, an elliptical portion of skin may be excised and the gap closed by sutures.

Entropium.—When the lower lid is *inverted*, we have the condition of *entropuim*. For this, Jansen's operation is shown in Fig. 344. The object is to tighten the fold of skin, by removing two portions of it, one near the outer and the other near the inner angle. A fold being pinched up with forceps, 1, is snipped out with curved scissors, 2, and the edges brought together with harelip sutures, so as to make the wound linear instead of elliptical; in the manner shown at 3—4.

Fig. 344.

Some surgeons prefer pinching up the fold of skin, in cases of entropium, with a pair of forceps, and shaving it off closely. Dr. Morton's forceps for this purpose have a sliding knife, which is pushed forward after the fold of skin is grasped, and thus cut it with perhaps greater accuracy.

Ancyloblepharon.—Union of the edges of the lids, when

complete and congenital (which is very rare), may be removed by an incision; when partial and consisting of a junction of the lids near one angle, which is sometimes caused by cicatrizing ulcers, it is incurable.

Symblepharon signifies a union of the lid to the globe, following some accident that has caused ulceration of both—the introduction of lime, for instance. It is irremediable, if the adhering surfaces are extensive. Very slight adhesions (frœna) may be divided; but the raw surfaces are too apt to adhere again. To prevent this, Mr. Walton divides the band vertically through its entire thickness, and brings the edges of each side severally together by sutures.

Trichiasis signifies a growing inward of the eyelashes. Sometimes the lashes which turn in, seem to constitute a second or distinct row, and the term *distichiasis* has been applied to this state. Mr. H. Walton has shown, however, that the appearance of this supposed independent row is a deception, and depends on the isolated position of the innermost lashes when inverted.

Causes.—It seems to depend on some changes in the fibro-cellular tissue in which the cilia follicles lie, produced by irritation. The disease is exceedingly common amongst the lower orders, especially the Irish.

Treatment.—If plucking the lashes proves ineffectual, an operation must be resorted to; and three are enumerated by Mr. Walton. One consists in the excision of a portion of skin from the lid, so as to give a sufficient outward tendency to the whole lid, to keep the inverted lashes away from the globe. An incision is made through the skin of the lid close and parallel to the lashes. A second incision is made to meet the extremities of the first, and to include an elliptical portion of skin between them, which is next dissected out, and the edges brought together by sutures. The other operation consists in the extirpation of the roots and bulbs of the offending lashes. An incision is first made along the edge of the lid through the skin, corresponding to the lashes that are to be removed. Two other short cuts are then made at each end at right angles, so as to form a small flap, which is to be lifted, and the bulbs of the hairs most carefully dissected off the cartilage. The skin is then to be laid down, and

retained by a stitch. The third is a last resource, and must be done only as an extreme measure, and when there is so much thickening of the lid edge, and so much irregularity of the lashes, that neither of the others will suffice. It is to dissect away the hair follicles from the entire tarsal border.

Lagophthalmos (hare-eye) signifies an inability to close the palpebræ. Sometimes it arises from the contraction of cicatrices, and requires the same treatment as ectropion, when arising from the same cause. But it sometimes depends upon inaction of the orbicularis muscle, through palsy of the portio-dura; so that the levator palpebræ being unopposed, keeps the eye open. This may be caused by exposure to cold—on the outside of a coach, for instance: in which case it is attended with numbness of the cheek, and generally subsides in a few days with appropriate treatment. But it may also be caused by a tumor in the course of the nerve; by disease of the part of the temporal bone through which it passes; or by congestion within the head.

Ptosis signifies a falling of the upper eyelid from palsy of the third nerve. Sometimes it is attended with headache, giddiness, and other signs of congestion in the head, which should be treated by the indicated remedies. Sometimes it arises from debility, and may be removed by treatment. Sometimes it is an accompaniment of that form of amaurosis which arises from organic cerebral disease; and is attended with dimness of sight, a sluggish dilated pupil, and more or less strabismus; the eye being turned outward and downward because the external rectus and superior oblique are the only muscles unparalyzed. If it occurs without any assignable cause, and persists, notwithstanding the employment of every measure calculated to improve the health, a portion of skin must be taken out from the eyelid, so that the lid may be brought under the influence or action of the occipito-frontalis muscle, and be elevated by it. This must not be done, however, if, as Mr. Walton remarks, double vision should be caused by the eye being thus brought into use. This author says further, that the portion of skin to be removed must be taken near the eyebrows else the lid may be everted, and should be dissected neatly out with a scalpel, so that there may be no scar.

Ptosis signifies falling of the upper eyelid *from any cause whatever*. In addition to that of palsy of the third nerve, which of course acts by producing paralysis of the levator palpebræ, the only cause pointed out by Mr. Druitt, should be added congenital absence and wounds of that muscle, hypertrophy, of the cellular tissue of the upper lid, and also disappearance of the cellular adipose tissue and elongation of the skin, as is witnessed in aged persons. The treatment of the case will of course consist in removing the cause; if the lid be too long it will be made shorter, if too heavy it will be made lighter, and if the muscle be feeble, the surgeon will endeavor to increase its force.

§ 8.—OPERATIONS UPON THE LACHRYMAL APPARATUS.

Surgical Anatomy.—The lachrymal gland is situated at the upper and outer part of the orbit. At the inner angle of the eye, the upper canaliculus and the lower empty together into the lachrymal sac, or upper part of the lachrymal canal or ductus ad nasum, which by the removal of the os unguis and interior part of the left superior maxillary bone, is exposed.

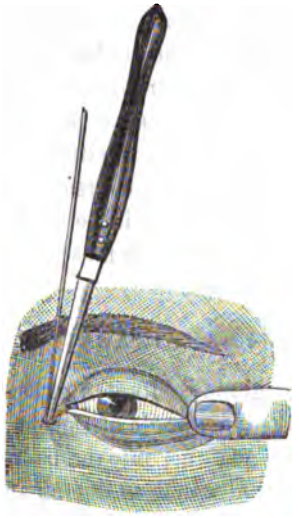
Probing and Division of the Puncta and Canaliculi.—

Fig. 345.

Fig. 345, exhibits the mode of introducing a probe through the upper punctum. The patient may sit in a chair, his head resting on the chest of the surgeon standing behind him; or he may lie on a steady table, his head on a firm pillow. A delicate probe is entered at the punctum, and carried inward along the canaliculus, till it reaches the lachrymal sac; the outer angle of the eyelids is drawn upon so as to render all the parts tense. Fig. 346. If now the handle of the probe is elevated, the point will take the course of the dotted line, and emerge in the inferior meatus of the nose, just behind the anterior end of the lower turbinated bone as seen in Fig. 345. A probe can be introduced in the reverse direction from below upward, by curving it somewhat sharply about an inch from its extremity, and entering it beneath the turbinated

bone, as just mentioned; but this exploration is now very seldom made.

Fig. 846.



When the canaliculus is to be slit up, we use instead of the probe a delicate grooved director, its groove upward in the lower, downward in the upper, canal; along this is guided a fine bistoury, either sharp or probe-pointed, which is then made to cut its way out. Some surgeons use merely a fine-beaked knife.

It is sometimes desirable to wash out the cavity of the lachrymal sac, as for example in cases of chronic inflammation. This is done with Anel's syringe, the tube passed through the lower punctum, as in probing, the operator's other hand steadying the parts to prevent undue pressure.

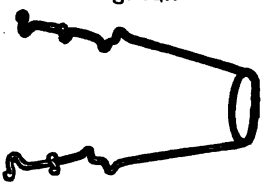
A better plan is proposed by Mr. Soelberg Wells, viz.: to have the nozzle, about three inches in length, with a crossbar at the top, for separate introduction. To this is fitted accurately a slender India-rubber tube, one and a quarter inch in length, with a plain joint at its extremity, to which the syringe is attached after the canula has been introduced. The patient can then lean his head forward over a basin during the injection.

The operation of pucturing the lachrymal sac, in cases of obstruction, as shown in Fig. 846, is now, in some measure, superseded by that of slitting up the canaliculi and passing Bowman's probes. Of these there are from six to twelve, cylindrical, arranged in pairs and numbered according to size. The direction of the knife or probe, in either procedure, is that indicated in the plates; some eminent authorities recommend the former instrument, rounded at its extremity, and made to divide the stricture at several points in the circumference. A strong, sharp-pointed, grooved director is sometimes used to make a way for the style. The introduction of the gilt, silver or leaden style, alongside of the puncturing knife, may be employed after an incision is

made into the sac. Formerly, it was the custom to use bougies of twisted catgut; but these are now never employed when any others can be obtained.

Operations upon the Conjunctiva.—In all operations on the eyeball, we must keep the lids out of the way; for this purpose there are several forms of instruments. An assistant may raise the upper lid by means of the elevator; another may be applied to the lower lid in the same way, if necessary. Another form of the same instrument is shown in Fig. 347, which has a spring to keep itself in place.

Fig. 347.



In order to steady the ball, as during the operation for strabismus, or for cataract, we may use either a fine single or double hook, or a pair of delicate-toothed forceps. In either case it is requisite to get a firm hold with the instrument, and in order to do this it is best to apply it over one of the tendons inserted into the ball. Thus, in convergent strabismus, we catch the tendon of the external rectus; in operating for cataract, from above, that of the inferior rectus.

In order to dilate the pupil, whether for a cataract operation, or for any other purpose, we use a solution of *Atropia* or one of its salts, five grains to one fluid ounce of distilled water, dropped into the eye half an hour beforehand.

To contract the pupil, the only means known at present is the Calabar bean. A small quantity of the alcoholic extract of this bean, rubbed up with glycerine or syrup, is dropped in the eye; or a piece of soft paper saturated with it is placed on the conjunctiva.

Pterygium, a vascular fleshy growth extending from some portion of the outer margin of the ocular conjunctiva toward the cornea, sometimes requires removal. The patient being etherized, the lids are held apart either by the wire speculum or by the fingers of an assistant, while the surgeon dissects away the mass with a delicate knife and forceps, working from the centre outward. No hemorrhage not easily controllable by cold water will take place.

When, as sometimes happens in cases of ophthalmia, it becomes necessary to score or lance the inflamed conjunctiva

lining the lids, the operation is best done with an instrument which resembles somewhat the ordinary gum-lancet, having a cutting edge at its convexity. The lid being everted, the knife is drawn several times across it, cutting as deeply as the case may seem to require.

Prolapse of the Iris, in consequence of penetrating wounds of the cornea, may be attempted to be reduced by closing the eye, and very gently rubbing the lid against the cornea, so as to press on the prolapsed portion, and afterwards by exposing it to a strong light, so as to cause the pupil to contract. Or a solution of *Atropia* may be applied to the conjunctiva.

Excurvation of the Eyelids is the name used by Laurence for the peculiar deformity observed, particularly in the upper lid, in cases of inveterate trachoma; the remedy, according to this writer, consists simply in dividing the outer canthus, and uniting the cut edges of conjunctiva and skin by stitches above and below.

§ 4.—OPERATIONS UPON THE MUSCLES.

Strabismus, or squint, very often demands an operation for the division of the muscle which causes it, by its undue contraction. Usually it is the internal rectus which is at fault; sometimes the superior rectus must also be cut.

Surgical Anatomy.—The anatomy of the muscles must be well understood by any one performing the operation; within the outer wall of the orbit are found the following points of interest: 1, eyeball; 2, elevator of upper eyelid; 3, superior rectus muscle; 4, external rectus; 5, inferior rectus; 6, outer part of inferior oblique, inserted into the ball close to the anterior part of the external rectus; 7, tendinous ring affording origin to all the recti muscles, close to the optic foramen.

Before proceeding to operate the surgeon should determine, by tests described in works on the eye (Wharton Jones, Stellwag, or Soelberg Wells), which eye is most at fault; occasionally both have to be treated.

There are two untoward consequences to be guarded against in doing this operation: first, the formation of a fleshy prominence or caruncle on the ball, at the point of division of the tendon; and secondly, the retraction and sinking in of the inner angle of

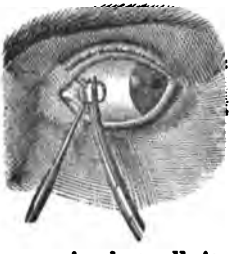
the eyelids. When either or both of these conditions exist, there is produced a prominence, more apparent than real, but very unsightly, of the inner side of the eyeball. They are avoided by making the section of the tendon close to its point of insertion, and by disturbing the conjunctiva and subjacent tissue as little as possible.

The instruments required are: a spring speculum or a pair of elevators; two pairs of forceps; a delicate blunt hook, and a pair of fine blunt-pointed scissors, curved on the flat.

Anæsthesia having been induced, the lids are separated, and an assistant draws the ball outward with the double hook, or, which is better, with a pair of fine-toothed forceps. With another forceps, the surgeon pinches up a fold of the conjunctiva a little above the lower edge of the tendon of the internal rectus, and nicks it with the scissors horizontally, perpendicularly, or obliquely. (Some surgeons make an incision along the lower edge of the tendon, passing one blade of the scissors beneath the pinched-up fold.) Next, the tendon is to be drawn up and divided. This was formerly done with forceps.

A better plan, however, and the one now universally employed, is to pass the blunt hook through the opening in the conjunctiva, under the tendon, thus drawing the latter out, and enabling the operator to pass one blade of the scissors alongside of the hook, and to make the division, as in Fig. 348.* The edge of the conjunctival wound should now be lifted a little, and a finer blunt hook swept across the gap in the tendon, to ascertain that all its fibres have been divided. Some surgeons pass the outer blade of the scissors between the conjunctiva and the tendon; others make the section with a tenotome.

Fig. 348.



Immediately after the operation, the effect produced is to be tested, and if excessive, a fine suture should be passed so as to bring together the edges of the conjunctival wound. Some sur-

* In the Fig. 348, the artist has made the division of the tendon much farther back than it should be.

geons always insert a suture or two to prevent deformity, but this is not essential. In passing these sutures, which should be of very fine silk, delicate curved needles are used; the procedure is greatly facilitated by employing a needle-forceps. These needle-forceps are very valuable adjuncts to any case of eye instruments.

§ 5.—OPERATIONS UPON THE EYEBALL.

Operations for Cataract.—In order to understand the operations for cataract,—opacity of the lens (lenticular cataract), or of its capsule (capsular cataract),—it is essential to keep in mind the anatomy of the organ, with which the surgeon should thoroughly acquaint himself. Before venturing to operate on the living subject, not satisfied with this knowledge, he should practice the various procedures on the eyes of calves and sheep, easily obtainable from the butcher, and upon the human cadaver at every opportunity.

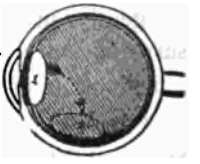
Of the three chief operations for cataract, depression or reclination, solution, and extraction, the first is now in great measure abandoned by eye-surgeons, on account of the frequent occurrence of inflammation and total blindness after it.

Surgical Anatomy.—At the anterior part of the eye ball is the cornea, set like a watch crystal in the sclerotica. Within the latter is the choroid, or pigment-bearing membrane, and within this the retina, or expansion of the optic nerve. At the ftont portion is the iris, the perforated muscular curtain or diaphragm which regulates the amount of light entering the eye; and just behind it the lens. Between the lens and the retina is the posterior chamber, containing the vitreous humor; and between the lens and the cornea is the anterior chamber, containing the aqueous humor. The optic nerve enters the sclerotic posteriorly, and immediately expands into the retina. The ciliary muscle skirts the outer margin of the iris, and forms one of its attachments to the inner surface of the sclerotic coat, close to the sclero-corneal junction.

Depression of Cataract.—The operation of depression consisted at first simply in crowding down the opaque lens from opposite the pupil or perforation of the iris. It was improved upon by the proposal to turn it over backward and downward,

into the posterior chamber of the eye. The lids being held apart by an assistant, the needle, a slightly curved, sharp, double-edged instrument, is introduced through the sclerotic about two lines (1-6 inch) from the outer margin of the cornea, a little below the middle line, and carried steadily behind the iris, across the front of the lens, its convexity always backward. In doing this, it is held like a pen, the surgeon resting his ring and little fingers against the patient's cheek-bone. The blade being thus brought to bear against the anterior surface of the lens, the handle of the instrument is swept upward, while the blade is pressed backward in such a manner as to rotate the lens downward and backward from 1 to 2. Fig. 349.

Fig. 349.



Absorption or Solution of Cataract.—Anæsthesia is not absolutely needful for the operation of division, but may be used in cases of children, or nervous and sensitive adults.

The operation for absorption is applicable to soft cataracts, especially in patients under the age of twenty-five. The pupil having been dilated by means of *Atropine*, and the eyelids opened with a speculum, the needle is entered a little below the median plane, near the corneal margin, to be carried up in front of the iris, to the anterior surface of the lens. Its handle is now brought up horizontally, and rotated so as to bring one of its edges aginst the capsule, which is lacerated by a to-and-fro movement to the extent desired. The older the patient, the more limited the incisions should be; the operation may be repeated, if necessary, after all symptoms of irritation have subsided. When the laceration of the capsule is too free, the lens may absorb the aqueous humor largely, swell up, and by pressure on the iris and ciliary body, produce great pain and disturbance; or fragments of it may fall forward into the anterior chamber, and set up inflammation there.

Another mode of doing this operation is to enter the needle through the cornea, a line or two from its junction with the sclerotic, and below the median plane. The moment the entrance is fairly effected, the point should be so guided across as not to catch in the iris. Arriving in front of the lens, the edge should be turned against the capsule, and made to lacerate it in the same

way as before mentioned. Hays's needle, which is rather a very fine bistoury, answers extremely well for this procedure. Another excellent needle for this operation is that known as Bowman's stop-needle, which has a perfectly cylindrical shank, and a shoulder at its middle point.

Extraction of Cataract.—Various methods and modifications of methods have been proposed for the performance of this operation, which consists essentially in the opening of the anterior chamber, and the escape of the opaque lens, either spontaneously, by gentle pressure, or by the instrumental assistance of the surgeon.

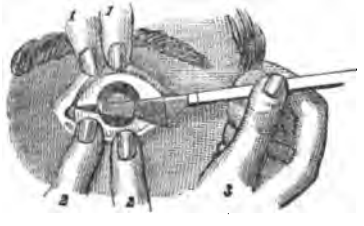
Dilatation of the pupil by *Atropine* is always necessary. Anæsthetics will not be required unless the patient is very nervous and timid; and when they are given, every precaution should be taken to avoid the occurrence of vomiting. The patient may lie on a firm bed or table, his head steadied, and the operator standing either beside him or behind his head.

The steps of the operation are:

1. The section of the cornea; made upward, downward, or laterally.
2. The laceration of the capsule (omitted by some operators when lens and capsule are taken away together).
3. The iridectomy (not always, but generally done, except when suction is employed).
4. The removal of the lens, by pressure, by the scoop, or by suction.

The section of the cornea may be made either with Beer's knife, or with Sichel's, or by Von Graefe's method. Fig. 350 shows the method of making the lower flap. An assistant holds up the upper eyelid, 1, 1; the surgeon then, with his left hand, 2, 2, either depresses the lower eyelid, or fixes the ball by grasping the tendon of the inferior rectus with a pair of toothed forceps, while with his right, 3, he enters the knife close to the outer margin of the cornea, and carries it nearly straight

Fig. 350.



across, with a steady push, until the counter-opening is made at the inner side. Continuing the same motion, the knife cuts its way out, and the flap is made.

Upon the removal of the knife, it sometimes happens that the lens is expelled by the pressure from within, and a portion of the vitreous humor may be forced away along with it; when this is the case, the lids should be at once gently closed, a pledget of lint wet with *Staphysagria* lotion applied, and the patient kept as quiet as possible until the corneal wound heals.

But when the lens remains in place, a cystotome is gently introduced through the wound, and the capsule is freely lacerated in various directions. Great care must be taken in so doing, to make no pressure backward against the lens.

Now, withdrawing the cystotome, the surgeon steadies the lower lid and the eye with one or two fingers of his left hand, while with the handle of his knife he exerts a very gentle pressure through the upper lid upon the ball above; when the lens will generally leave its place, slip into the lower part of the anterior chamber, and thence escape by the corneal wound. The operation is thus completed; the eye is gently closed, and the patient is placed in bed.

Von Graefe's method.—An important modification of these sections, known as the linear method of Von Graefe, has of late years been extensively adopted.

The incision is made with a long narrow knife, which is entered in the sclerotic, close to the margin of the cornea, with its edge upward; it is carried at first downward and across the interior chamber, but then, by depressing the handle, its point is brought up so as to emerge through the sclerotic just opposite the place of entrance. The edge is now turned forward, and the knife carried across for nearly its whole length, when it is drawn back again, cutting its way out a line or so above the corneal margin. Thus a *conjunctival flap* is made; the advantage of which is the greater certainty and readiness of union.

Next an iridectomy is done, by passing through the wound a blunt iris-hook, engaging the edge of the iris, drawing it out, and snipping it off with iris scissors close to its ciliary attachment.

The next step is the laceration of the capsule, done with the cystotome as before described.

Finally, a scoop, or a wire loop is introduced, engaged behind the lens, and gently manipulated so as to bring the lens out with it.

(If, after the operation of extraction has reached the second or a later stage, the corneal wound is found to be too small, it may be enlarged by means of an instrument which is introduced *into* the wound closed; its blades are then expanded to the desired extent, and made to cut their way out.)

Suction.—Another mode of removing cataracts, when of soft consistence, is that of suction. For this, which is an old plan revived, a fine silver canula is used; it is connected by a short flexible tube with a glass bulb, and this again by a somewhat longer tube with the operator's mouth or a small syringe. A broad needle is passed through the cornea near its margin, and made to lacerate freely the anterior capsule; the canula is then gently inserted through the wound, and carried to the centre of the lens, when by very gentle suction with the mouth or syringe the lenticular substance is drawn through the canula and tube into the glass bulb.

When the whole cannot be removed at once, solution by the aqueous humor may ensue; or a second suction may be done at a later period, if needful.

For some time afterward, the pupil should be kept dilated with *Atropine*, lest iritis should result from the irritation of unremoved portions of the lens.

Iridectomy, or the cutting away of a part of the *iris*, alluded to above, is a procedure which has of late years acquired a greatly increased importance. Besides being an important step in many cataract operations, it is done to restore sight (artificial pupil), and to relieve intraocular tension.

The instruments necessary are: an eye-speculum, fixation-forceps, a lance-shaped knife, or Von Graefe's, an iris forceps or hook, and scissors curved on the flat.

It is well to have several pairs of iris forceps at hand, in the eye-case, as well as various forms of iris scissors for the different purposes required in the operation.

An assistant induces complete anæsthesia; another steadies the head and attends to the eye-speculum. The surgeon makes

the corneal incision, using a straight knife if operating from the outer side, and one bent on the shaft if from the upper or inner side; the eye being steadied by means of forceps applied exactly opposite to the point of entrance of the knife. Fig. 351 shows the mode of making the incision, also on the outer side of the cornea, with the slender knife of Von Graefe. Entering the sclerotic close to the margin of the cornea, the surgeon pushes the knife on, keeping clear of the iris and lens, until the incision is of the desired size; he then slowly withdraws the blade. Next, giving the fixation-forceps to an assistant, he insinuates the iris-forceps, closed, through the wound, catches a fold of the iris, draws it out, and with the scissors snips it off close to its ciliary attachment. This snipping may be done at once, or in two portions. The quantity cut away must vary according to the object; for glaucoma, or intraocular tension, about one-fifth of the iris may be removed, while less will suffice if the object be merely the admission of light.

Fig. 351.

Again, in the former case the operation may be done from above; in the latter, the inner side of the cornea is better.

The operation completed, the lids are gently closed, a light and well-arranged pledget wet with *Staphysagria* lotion and covered with a roll of fine raw cotton laid over the eye, and a bandage put on to keep it in place. The best form of bandage is a strip of fine muslin or linen, about two and a half inches wide, cut away at either end so as to leave two narrow ribbons, one to go above and the other below each ear, and to be tied behind.

The subsequent treatment must vary greatly with circumstances.

Iridodesis.—This operation,—ligation of the iris,—is performed by making a small incision (a broad needle answers very well) close to the margin of the cornea. Through this a fine blunt hook is inserted, the iris caught and drawn out, a small loop of very fine black silk (easly seen) laid around the prolapsed portion, which is then strangulated by drawing on the ends of the silk with two pair of cilia-forceps.

One of the ends of the silk is cut off very short; in a day or two the loop is pulled away. The corneal wound generally heals speedily, and no inflammation is set up.

Extirpation of the Eyeball is called for when, sight being lost or greatly impaired in one eye, the other is attacked with sympathetic inflammation; or in cases of malignant disease.

The patient being placed under the influence of ether, an incision is made near the cornea, parallel to its inner margin, exposing the tendon of the internal rectus muscle, which is divided. A pair of scissors curved on the flat is passed along the inner side of the globe, and the optic nerve divided; the eyeball can now be turned outward, and the muscle inserted into it divided successively, as close as possible to the sclerotic, the conjunctival incision being extended as this is done.

Should any bleeding occur, it is readily checked by pressure with a plug of lint wet with *Gossypium* lotion, or by a stream of cold water from a small syringe.

The subsequent treatment is like that of any other wound.

Removal of the entire contents of the orbit, for tumors, has been done very often, but seldom with permanent good results. It is not a difficult operation, thoroughness being the great object to be aimed at.

Removal of the anterior part of the eyeball has been so generally abandoned, even by those who were its most earnest advocates, that it need not be here described. Inflammation almost always occurs in the portion left, and gives rise to about as much trouble as if no part had been taken away.

Staphyloma is a term employed to signify any protrusion on the anterior surface of the eye.

Staphyloma of the cornea is said to exist when a portion or the whole of the cornea, whose texture has been disorganized by injury or disease, has perished, and the cicatrix with which the iris has become covered, bulges before the pressure of the humors of the eye, and forms an opaque white prominence. Fig. 352. If *partial*, it is usual to recommend that the nitrate of silver or butter of antimony be applied to the apex of the staphyloma, so that the inflammation excited may thicken the cornea, and enable it to resist further protrusion; the caustic to be well

washed off with milk before the lids are closed. But besides sympathetically affecting the other eye, it is seldom that the use either of the nitrate of silver or butter of antimony checks the increase of staphyloma, and sooner or later the eye collapses from the necessarily extensive use of the knife. Therefore, when the staphyloma is still limited, Mr. H. Walton shaves it off; by which means the cut part frequently cicatrizes, and no further protrusion is effected. This treatment is applicable to small staphylomata, and especially those that rise suddenly, and have a small, well-defined base.

Fig. 852.

Staphyloma of the cornea.

§ 6.—TUMORS IN THE ORBIT.

Protrusion of the Eyeball.—We have already spoken of tumors in the eyelids; of tumors on the surface of the conjunctiva; and of tumors resulting from disease of the lachrymal gland. We have yet to allude to the fact that tumors, fatty, osseous, encysted, and *solid* or *sarcomatous*, as they were formerly called (which have not yet been sufficiently examined), may occur within the orbit, causing as their general symptoms, protrusion, with more or less displacement of the eyeball, and projection at the seat of the tumor. The danger of tumors in this situation is twofold: destruction of the eye from continued pressure; and protrusion through the roof of the orbit into the cavity of the skull, with compression of the brain; which should be averted by extirpation so soon as the morbid growth is of a size to threaten mischief. Sometimes it is good practice to puncture, or still better to lay open, an encysted tumor by a free incision.

But it is not every protrusion of the eyeball that is caused by tumors. For instance,—1. An excessively protruded and goggled state of the eyeball sometimes occurs in connection with *anæmia*, general debility, and enlargement of the thyroid gland. 2. *Suppuration*, or inflammatory effusion, may take place within the orbit. This may occur either internal or external to the *ocular sheath* of Bonnet and O'Ferral; a layer of fascia, immediately surrounding the eye, extending from the posterior margin

of each palpebra to the apex of the orbit, and perforated by the ocular muscles. Effusion may take place in the orbit either internal or external to this sheath. If internal to it, there will be a chemosed-like projection of the conjunctiva at its angle of reflection from the eyeball to the palpebra. If intense pain, unrelieved by treatment, with shivering, indicates the presence of pus, a puncture should be cautiously made within the palpebræ by the side of the eyeball.

Cancer may affect the eye or other contents of the orbit, particularly during the earlier periods of life. It may occur in any form, or affect any structure; for the common opinion that it usually first attacks the optic nerve or retina, is, according to Lebert and Paget, not well founded. The scirrhous, or hard variety, is very rare; most ocular cancers being of the soft or else of the melanotic variety.

Cancer within the Orbit.—Weight, perhaps pain in the orbit, and displacement of the eye, with dimness of vision, are the earliest symptoms; which are followed by the protrusion of a tumor. Engorgement of the surrounding bloodvessels, destruction of the eyeball, adhesion of the palpebræ, protrusion of a large tumor, bleeding, sloughing, or exuding thin offensive discharge, cancerous deposits in the cranial cavity, in the cervical glands, and in distant orgahs, follow in succession.

Cancer within the Eye.—After some amount of vascularity, and of other signs of derangement of the eye—or, perhaps, after it has been discovered (if the patient is a child) that the sight of the eye is lost—an examination is made, and a patch of metallic lustre, of a grayish, reddish, or yellowish-white color, is discovered deep in the eye, behind the crystalline lens. The iris is tarnished, and sluggish. As the tumor grows, and comes nearer to the cornea, it can usually be clearly distinguished as being lobulated, and covered with bloodvessels. In time, it fills the eye, and presses the iris against the surface of the cornea, the eyeball is tense and painful, and the surrounding parts very vascular. Finally it bursts through the cornea or sclerotica; a huge fungus protrudes, and the disease arrives at a fatal termination through the stages just indicated.

The *diagnosis* of intra-ocular cancer is important, because

deposits of lymph or tuberculous matter may occur in the depth of the eye, and present all the outward and visible signs of a cancerous growth. In fact, the diagnosis of such a growth is considered by the best authorities to be impossible, until time reveals whether the eye is to burst before a protruding fungus, and the health to exhibit the decay consequent on the extension of cancer; or whether, on the othe hand, the eyeball is, 1, to remain blind but unaltered; or, 2, to be the seat of scrofulous suppuration; or, 3, to waste and become atrophied; one of which three contingencies usually results when this peculiar appearance is the result of injury or of slow inflammation in a scrofulous subject.

Melanotic cancer is common in this situation, Lebert having found it in ten ont of twenty-three cases: it may primarily affect the orbit, conjunctiva, or optic nerve, but curiously enough, has not been found primarily in the iris or choroid, where it might naturally have been expected. Melanotic cancer pursues the course of soft cancer, but perhaps more rapidly.* Protrusion of a tumor exuding a darkish sepia-like fluid, and a great multiplicity of organs affected with secondary deposits, are leading features.

There is at present considerable confusion existing in the use of the term *melanosis*, which is often used as if synonymous with cancer. But, as we have before observed, *melanotic cancer* is true soft cancer, combined and infiltrated with large quantities of black pigment. On the other hand, collections of black pigment may exist in natural and morbid structures without cancer. Patches of black pigment may be found, and may remain for years on the conjunctiva unaltered.

Cancer may commence in the *conjunctiva* in the form of small vascular tumors, which soon display the characters of soft cancer, or the dusky hue of melanosis. Scirrhus is treated of by authors, but is extremely rare. Cancer, likewise, may affect the caruncle, constituting the disease formerly called *encanthis*.

It may also affect the lids; but here we must note the not unfrequent occurrence in aged persons, first of epithelioma on the lower lid; commencing as a wart, lasting an indefinite time, but,

---

*See Cancerous Tumors, vol. 1, p. 589.

if irritated, terminating in incurable ulceration; yet altogether different from cancer in structure, and giving much more hope for extirpation. Secondly, of a glassy ulcer of the *lupis* kind.

Treatment.—The treatment of cancer of the eye comprises two classes of measures: 1, the various remedies mentioned in vol. 1, page 588; 2, extirpation, which latter is also to be regarded as palliative, since, in cancer of the eye, the disease (if not already developed within the cranium) is sure to appear there or elsewhere. It seems to be the general opinion of surgeons, that it is useless to extirpate soft cancer of the eyeball, especially in children; but that, in the melanotic cancers, the extirpation of the contents of the orbit affords a greater chance of prolonging life; and that all superficial cancerous tumors of the conjunctiva should be freely extirpated as soon as possible.

Artificial Eyes consist of a thin scale of enamel colored to imitate the natural eye. They are adapted for cases in which the globe is sightless and shrunken, after the removal of staphyloma, for instance. "Besides the removal of deformity," says Mr. Walton, "the presence of the false eye may be of essential service in keeping the lids in their natural position; and preventing the cilia from irritating the shrunken globe; in placing the puncta in a more natural position for conveying away the tears; in acting as a defense against intruding bodies, which are apt to be retained within the lids and to produce irritation, and as a means of keeping the cavity free from collections of lachrymal secretions."

After staphyloma or any other disease which has rendered the eyeball shrunken and sightless, if the patient objects to the trouble and expense of an artificial eye, it may be convenient to divide the levator palpebræ, in order that the lids may remain permanently closed. This may be effected by making a transverse incision in the upper eyelid just below the orbit, and seizing the belly of the muscle as far back as possible. Then a piece should be snipped out of it with the scissors.

§ 7.—THE OPHTHALMOSCOPE.

This instrument is to the eye what the stethoscope is to the chest. It has already rendered obsolete nearly all that has been

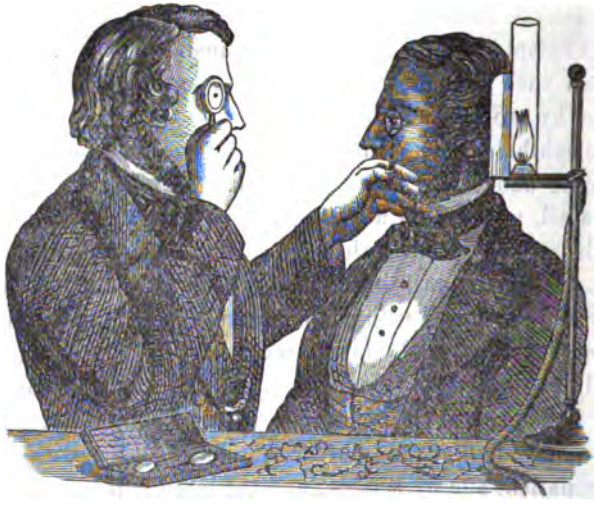
written on the deep-seated diseases of the eye; for it has been the means of detecting changes unaccompanied with any objective symptoms, and not known till quite lately to exist. Its use is quite indispensable in all cases of impaired vision, not attended with extreme intolerance of light. Very seldom indeed does a patient complain, from the use of the instrument, except in cases in which such a result might fairly be expected, and might be avoided by ordinary caution.

The ophthalmoscope, in its simplest form, is a concave circular mirror of about ten inches focus, made of silvered glass or polished steel, and having a hole in the centre. As an appendage there is needed a convex lens an inch and a half in diameter, with a focus of from two and a half to three inches, set in a common eye-glass frame with a handle three inches long. The investigation must be made in a dark room. The patient's pupil should be dilated as a rule. The light of a candle is hardly sufficient, certainly not for beginners. An oil lamp is better, but by far the best is an argand burner that slides on a vertical rod.

The patient sits by a table, and the lamp is placed by his side close to his head, with the flame on a level with the eye, from which it is screened by a little flat plate of metal attached to the burner. The operator sits directly in front; and, holding the instrument close to his eye, and a little obliquely to catch the light from the lamp, he commences at the distance of about eighteen inches from the patient, to direct the reflection on the eye. When this is got, the convex lens must be held at the distance of two and a half inches from the eye and the focusing commenced, by moving them slowly backward and forward. When the light fairly enters the eye a reddish glare appears, and as it is focused, an orange-red or orange-yellow is seen; then the bloodvessels of the retina come into view. The retina itself presents a whitish aspect, through which the choroid is more or less discernible. The entrance of the optic nerve should now be sought; probably a part of it will already have been seen as a whitish spot; but the way to discern it properly is to make the patient look inwards. It appears as a whitish circular spot, in the centre of which are the central vein and artery of the retina, giving forth a variable number of branches, usually six or eight.

The convex lens is not usually needed for examining near-sighted eyes, nor, in general, for the anterior structures of the eye. The annexed sketch, Fig. 353, illustrates the above description,

Fig. 353.



Mode of making an ophthalmoscopic examination.

and accurately shows the proper position of the lamp, the direction of the patient, and the slightly raised position of the observer.

But what is the principle of the ophthalmoscope; why is a reflector needed; why cannot the eye be illuminated with the very lamp from which the light is borrowed? When a stream of light is thrown into the eye, the rays are reflected back by the retina and choroid, and, returning as they enter, are brought to a convergence at the spot whence they emanated. This takes place when any luminous body is held before the eye; hence when a candle or lamp is used, we see no illumination, simply because the flame is in the focus of reflection, and our eye cannot be there too, nor can it see through the flame. This difficulty is overcome by using a mirror with a hole in the center (the ophthalmoscope), which represents the flame, and, by looking through the hole, we place our eye in the center of the reflection, and thus see the lighted interior of the patient's eye. It is possible, by certain arrangements of light, and position of the beholder, that the eye

may be to an extent seen illuminated; but for the full effect, the ophthalmoscope is requisite.

Healthy Appearances.—The *arteries* and *veins*—the latter being larger and darker—radiate on the retina, and branch and anastomose almost to the ora serrata. No vessels cross the situation of the macula lutea.

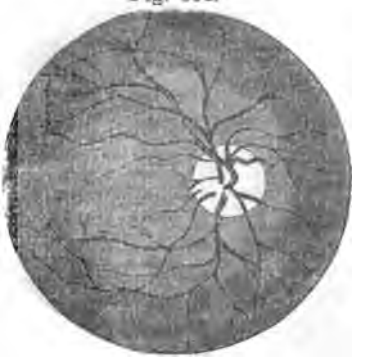
It is not uncommon in eyeballs that are diseased to see the pulsation of these vessels; sometimes it may be seen in health, especially if the eyeball be pressed. Mr. Hume had a patient attending at the Central London Ophthalmic Hospital, with pulsating retinal vessels, although the sight was unimpaired.

The *Choroid* must be focused to be examined. The irregularly arranged markings of a dusky hue indicate the vessels. The coloration of the choroid is darker in persons of a dark complexion, and of a lighter and less distinct shade in those of a fairer skin.

The *Retina* is a perfectly transparent colorless structure, and is best recognized by means of the vessels which pervade it. The arteries are of a smaller calibre, and have a more direct course than the veins, which are more tortuous, and of a darker color, derived from their contents; but this last feature is not always well marked.

The *Optic Disk*, or termination of the optic nerve, as it enters the sclerotic, is the most important part to be noted in an ophthalmoscopic examination. In health it is circular in form, of a bright white color, and perforated generally in its centre, but frequently in different parts of its surface by three or four arteries entering the globe for distribution, and by as many veins which leave the interior of the eye. (See Fig. 354.) A slight hyperæmia of the disk is not incompatible with healthy vision.

Fig. 354.



Healthy appearances of the eye.

The *Macula Lutea* is that part of the retina which lies directly in the axis of vision, and which is brought into view by causing the

patient to look directly forward. Frequently there is no particular structure to be made out, and the part is generally recognized by the absence of the retinal vessels, which seem to avoid this situation. Sometimes a paler, and at other times a darker appearance are the only indications of it. It must, however, be borne in mind that it is often the seat of hemorrhages, morbid deposits, etc., which are more or less detrimental to perfect vision. It should therefore be carefully examined.

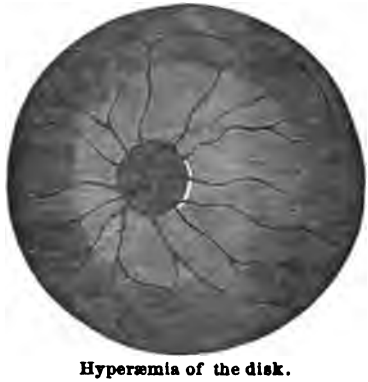
The *Vitreous Humor*, the aqueous, the lens and its capsule, and the cornea, are all parts which in the healthy state of the eye are transparent, and admit of a clear definition and observation of the whole of the posterior part of the interior of the eyeball.

Morbid Appearances.—Such is a description of the parts seen by the ophthalmoscope in the healthy state. We now propose, for the guidance of the student, to give an outline of the morbid appearances to be observed, premising that a thorough knowledge and use of this instrument can only be acquired by most careful practical study.

The *Optic Disk* is the first point to which attention should be directed in an internal examination of the eyeball. The changes in the disk itself are so frequently connected with changes in the parts around its circumference, that during its examination, the state of these circumferential parts must be carefully noted.

Hyperæmia of the Disk is of very frequent occurrence; the retinal vessels may be enlarged and dilated, and the veins varicose; in addition to which the surface of the disk may be seen finely injected, instead of showing its white normal appearance. This injection may proceed to such an extent as almost to hide the disk. Fig. 355. Hyperæmia of the disk is common in those cases of impaired vision from overwork, which are met with in the case of engravers, compositors, sempstresses, etc. Blood may be effused on the surface of the disk, constituting

Fig. 355.



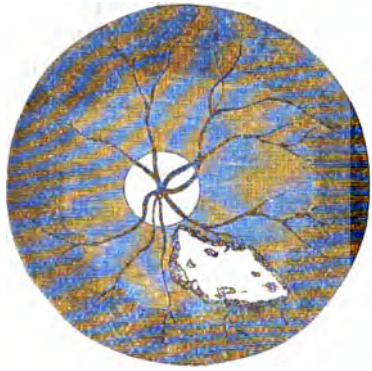
Hyperæmia of the disk.

what has been called apoplexy of the papilla. Black pigmental deposits are occasionally seen on its surface, and frequently at its edge. The disk may present a cupped appearance, as in glaucoma, where it is said to be indicative of intra-ocular pressure; or an elevated appearance of its center. The form of the vessels entering and leaving the center, and the nature of the shadow, as shown by varying the light, will be the best means of ascertaining in these cases which state is present.

Atrophy of the Disk is far from uncommon; it is often congenital; it is sometimes found in a squinting eye, and is often associated with excessive myopia. In cases of atrophy of the disk, the retina generally preserves its normal condition and vascularity. The optic disk does not always preserve its circular form; it is occasionally jagged in its outline, and pigmentary deposits are of frequent occurrence at its edge. From the choroidal degeneration which is often seen around its circumference, and from the white shining appearance of the sclerotic through the retina, the edge of the disk may be indistinctly defined, and the crescentic patche of sclerotic may be confounded with the outline of the disk by the beginner; but to the practiced eye the outline may always be distinguished.

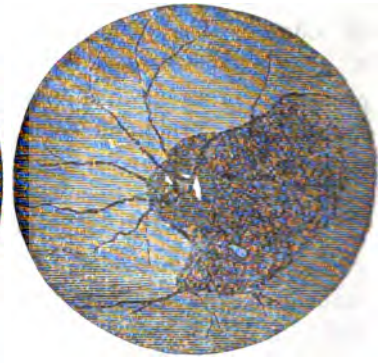
The Retina.—Its transparency should be unimpaired, and its vascularity not greatly different from that of the healthy state. If the disk be hyperæmic, it will naturally partake of the extra vascularity, but not always; for the disk may be injected with small vessels, while the retinal vessels are natural. Its vessels are subject to varicosities; and a certain indistinctness of outline is frequently observable in its overloaded veins. The arteries often show plastic exudations in their course, which have evidently been deposits during an inflammatory state, Fig. 356. Extravasations of blood are occasionally seen from the rupture of one or more of the vessels, Fig. 357; the gradual absorption of which may be watched. Serous effusions between the retina and choroid are attended always with more or less danger to sight, according to the locality and amount of the effused fluid. The retina may be seen, floating as it were, or lying in folds over the part, the bright red choroid of course being hidden from sight. As the effusion is over or near the macula lutea, so is a more

Fig. 356.



Inflammatory deposits on the retina.

Fig. 357.



Extravasations of blood on the retina.

unfavorable prognosis to be feared. The retina is often anæmic and even atrophied. M. Desmarres describes an affection which he calls œdema of the retina. It is doubtless affected in secondary syphilis.

The Choroid, as may be anticipated from the vascularity of its structure, is most importantly involved in chronic changes in the deep-seated structures of the eye; and although we are by no means disposed to draw any strict line between the inflammation of the different tunics of the eye, as existing independently of each other; yet this structure shows changes so marked that the effects of choroiditis may be safely classed under one head. The principal affections of the choroid are hyperæmia; when, instead of its usual somewhat orange-red color, it becomes of a bright scarlet, the vessels are enlarged, and the pigmental striations are more or less indistinguishable. The absorption of the pigment from some parts causing white patches, and its redeposition in others forming the black deposits so often met with, are signs of the atrophy and disorganization of this important structure. These black deposits may take place at any part of the fundus, but they are most frequently met with around the edge of the optic disk. They are always situated between the choroid and retina.

Atrophy of the choroid when occupying the situation of the macula lutea, is always attended with considerable impairment and confusion of vision, and is of course irremediable. Plastic

exudations from its surface, pushing the retina forward, are sometimes seen. The appearance of an eye which has been the subject of chronic choroiditis is most striking. The black, white, yellowish, and red variations of color have been described by Desmarres as the *Choroid tigree.*

Effusions of blood from the surface of the choroid may take place, and probably many of the deposits on its surface have had this origin. Colloid degeneration has been described by Donders.

An affection often met with in short-sighted persons, and involving both the choroid and sclerotic, must be noticed. The sclerotic is thinned at the posterior part of the eyeball, and bulges backward into a conical shape, carrying the choroid with it, and thus altering the antero-posterior diameter of the eye. It has been denominated sclero-choroiditis posterior. It generally takes place near the optic disk, and appears as a semi-lunar white patch, which more or less completely surrounds the optic disk. That the retina is perfect over this white patch is evident from the retinal vessels being continued over it in their normal size and distribution.

The *Macula Lutea* may be the seat of morbid deposits, hemorrhages and plastic exudations. Small vessels sometimes enter about these parts abnormally. All alterations from the healthy state in these structures are more or less detrimental to vision.

The *vitreous humor* is often the seat of hemorrhage. Floating particles may exitst in its substance, which is generally more fluid than in its normal state, or a greater or less degree of turbidity may interfere with its transparency, and envelope in a fog the parts posterior to it. Cholesterine scales may be seen floating about in it, and the cysticercus is occasionally seen in its substance. The vitreous humor should be thoroughly examined both within and without the lens. Floating particles and alterations in its anterior portion are best seen with the mirror alone.

The use of the ophthalmoscope in diagnosing cataract in its incipient stage must be very evident. It is necessary that the pupil should be dilated with *Atropine.* The frequency with which cataract commences in striæ at the edge of the lens, makes it impossible to state with any precision the condition of the whole structure with an undilated pupil. The striæ, which were undis-

cernible before the introduction of this instrument, are recognized with the greatest facility, appearing as black markings on the red field of the choroid. By fully dilating the pupil, also, we are able to examine well the capsule of the lens, which is often rendered spotted by deposits of uvea from the surface of the iris, and thus gives rise to muscæ and indistinctness of vision.

SECTION III.

OPERATIONS ON THE EAR.

As in dealing with diseases of the eye, only the more important operations were discussed, the reader having been referred to the many valuable works published on that specialty, so with diseases of the ear, none but the more common operations which the general practitioner may at any time be called upon to treat, are described. For the various affections which belong to the domain of aural surgery, the practitioner is referred to the treatises written upon that subject.

Foreign Substances in the Ear.—Children not unfrequently poke bits of slate pencil, peas, glass beads, etc., into the passage of the ear, which, if allowed to remain, would give rise to violent inflammation and deafness; any such body should, therefore, be removed as quickly and as gently as possible, either by syringing the ear with warm water, or by means of a small forceps, curette, or scoop. If it cannot be removed by gentle means, it should be allowed to remain quietly, says Mr. Vincent, when probably it will become coated with wax, and the passage will enlarge by interstitial absorption, so that it may be removed without trouble. The surgeon should always make certain, by an examination with the speculum, that there is a foreign body present, before he begins poking instruments into the ear, remembering that a late eminent hospital surgeon is said to have dragged out the stapes whilst fishing for a small nail, which was not in the ear after all.

For the removal of foreign bodies from the ear the instrument invented by Dr. Corse, and described by him in the *Amer. Journ. of Med. Sci.* for October, 1858, p. 409, may be found very use-

ful. The thin blades can be applied separately, and then united by the fulcrum.

Accumulation of Wax, mixed with hair and cuticle, in the external meatus, is a common cause of deafness. Syringing the ear gently with *Glycerine* and warm water is an effectual mode of dislodging it. Syringing, however, is not always to be done with impunity, for if the membrana tympani be inflamed or dry, and the passage devoid of wax, great irritation may be induced by a jet of water, especially if it be forcibly injected. The condition of the membrane, therefore, ought to be previously ascertained, by an examination with the speculum; avoiding the too common practice of using a probe without first ascertaining the cause of deafness. A little cotton should be inserted into the concha after syringing. The mixture used should be quite warm enough to be comfortable, and the syringe should hold one or two ounces; its piston should work easily and accurately, so that no air bubbles may be squirted in; the patient should be carefully protected by towels; and the liquid injected should be *clean*, and in a separate basin; the dirty water that has been already used should not be injected over again.

A large metal syringe is the best instrument for washing out accumulations of wax; a small elastic bottle is the best for applying lotions or injections; and one of the small elastic suction-bottles with a tube, commonly known as *Margett's*, is a capital thing to enable patients themselves to pass a gentle stream of *Aconite* water into the ear, as a fomentation, in any case of pain or inflammation. This is a most soothing process. Margett's syringe is also useful for *douching* the eye.

Polypus.—This term includes two sorts of morbid growths. The first, says Mr. Wilde, consists of fleshy pedunculated growths, nearly colorless, having a thin cuticular covering, unattended with pain, not appearing as the result of inflammation, and not accompanied with discharge, and usually attached to the middle glandular portion of the meatus. These are extremely rare. The others, which are very common, and which grow chiefly from the very bottom of the meatus, are consequences of otorrhœa, and are always attended with discharge. They are usually found of the size of a pea or bean, but may, of course,

be much smaller, or may be so large as to project from the meatus. When small they are usually of a florid red color. The examination of several specimens which had been removed by Mr. Harvey, consisted of fibro-plastic cells, with more or less of perfectly developed fibro-cellular tissue, and of almost structureless gelatinous substance. There is yet another polypus-like tumor which may be met with in the external meatus —viz., cancer. In its earliest stage, this may not be distinguishable, except by microscopic examination after removal; the rapid return of the growth, and the occurrence of palsy of the face, and other signs of the contamination of neighboring organs, will in time reveal the nature of the case.

Treatment.—The polypus must be removed completely; the point of its attachment be touched with lunar caustic, which must be applied from time to time, whenever it seems likely to sprout again, and the meatus must be regularly syringed with an astringent lotion.

The lunar caustic should either be cast in very fine sticks, like the leads of a patent pencil, or the tip of a fine probe should be coated with it, so that it may be applied exactly to the spot where it is required.

For the removal, the surgeon may employ either a stout Assalini forceps, or Mr. Wilde's snare. This consists of a fine steel stem, five inches long, and bent in the middle, in order that the hand which holds it may not get into the way of the eye. It has loops at the end and at the angle, through which a fine wire passes; there is a movable cross-bar, to which the ends of the wire are tied: and a thumb-hole to hold it with. The wire should be just long enough to enable the cross-bar to be drawn back to the thumb-hole. In using the instrument, the bar is pushed forward so that the wire may form a loop at the end; this is to be put carefully around the neck of the polypus; when, by pulling the bar back to the handle, it will cut the neck through.*

Another ingenious instrument was constructed by the late Mr. Avery. The forceps blades, when properly introduced, can be made to grasp the neck of the polypus, by the pressure of the

* Wilde's Aural Surgery, p. 420.

thumb on the button, which pushes forward the canula, so to close the blade.

Malformations of the Auricle are occasionally met with, usually in conjunction with other congenital defects; if the malformation consist in *contraction of the orifice* of the meatus, from undue projection of the tragus or antitragus, advantage may be derived from the employment of dilatation, or from excision of a portion of the cartilage. *Congenital closure* of the meatus by an abnormal membrane, may be remedied by an incision and the subsequent use of tents. *Supernumerary auricles* may be treated by excision, as in cases related by Birkett and Gross.

Tumors of the Auricle.—These may be cystic, fatty, fibrous, vascular, malignant, etc. Those particularly deserving mention are the blood-cyst, or *Hæmatoma Auris*, frequently observed in the insane, and the fibrous, cheloid-looking growth, which occasionally follows the use of ear-rings. The former affection requires the use of medicated lotions during the acute stage, followed by the introduction of a seton; while the latter may be treated by excision, though the disease is apt to return.

Tumors of the Meatus.—*Exostoses* are occasionally met with in the walls of the meatus, and, if large, may encroach so much on the canal as to cause deafness. The *treatment*, in the early stage, consists in the application of the tincture of *Iodine* to the surface of the growth aud behind the ear, and by a perseverance in this plan the increase of the tumor may sometimes be arrested. At a later period, little can be done beyond preventing the accumulation of wax or cuticle by frequent syringing. *Sebaceous* or *molluscous* tumors result from the enlargement of sebaceous follicles, and when laid open are found to consist of a cyst-wall containing layers of epidermis. If neglected, they are apt to cause absorption of the bone, and grave or even fatal cerebral complications. The *treatment* consists in laying open the cyst, evacuating its contents by syringing, and then drawing out the cyst-wall with forceps.

SECTION IV.

PLASTIC OPERATIONS ON THE FACE.

The deformities resulting from malformations, injuries and diseases of the face, vary so much in extent and degree that the operations for their relief can be described in general terms only, and the surgeon will be called upon to exert his ingenuity to meet the requirements of each case. In these operations three processes are required: first, the vivification of the edges of the portion to be united with new integument; second, the dissection of the skin mapped out to fill up the gap, so that it may be transplanted without loss of its vital integrity; and, thirdly, the placing of it in such a position that it will fill up the gap and restore as nearly as possible the natural appearance of the parts.

Rhinoplasty.—The whole or a portion merely of the nose may be destroyed by injury, by ulceration, with or without caries or necrosis, or by the ravages of lupus, or constitutional syphilis. Under these circumstances various rhinoplastic operations may be employed to relieve the deformity, it being, however, an invariable rule, no operation is to be performed until the destructive process has been *completely* and *permanently* arrested.

The patient being in good physical condition, the surgeon considers carefully the size and shape of the organ to be supplied, judging from the patient's other features. He then takes a sheet of gutta percha, and moulds it into the desired form, after which he spreads it upon the forehead, and traces its outline. One-third, at least, for shrinkage, should be allowed in making the section of integument. If the mark be made with a stick of the nitrate of silver, or the tincture of iodine, it will not be washed out by the blood. One or two scalpels, larger and smaller, in *perfect order*, two or three pair of good rat-toothed forceps, an abundance of harelip pins, fine suture needles and silver wire, fine silk or hempen ligatures, and a tenaculum are needed. Two good scalpels, curved on the flat in opposite ways, are of great use in plastic operations.

The patient being fully etherized, the surgeon makes a decided incision along the line traced, and dissects the flap up as cleanly

as possible. He carries the incision a little lower on the side *towards* which the twisting is to be made. Next, he freshens up all the parts with which the flap is to be connected. All vessels which spring should be carefully twisted or tied; and the edges left to glaze a little, while the wound in the forehead is brought together as nearly as may be with harelip pins, sutures and adhesive plaster. When the flow of blood from the wounds has ceased, the flap of skin marked out on the forehead, Fig. 358, is to be dissected up, and all the cellular tissue down to the periosteum with it, so that it may hang attached merely by a narrow strip of skin between the eyebrows. When all bleeding has ceased, the flap is to be twisted on itself, and its edges are to be fitted into the grooves made for their reception, and to be fastened with sutures. The nose thus made is to be supported, but not stuffed, with oiled lint; it should be wrapped in flannel to support its temperature, and if it become black and turgid, owing to a deficiency in the return of blood from it, warmth may be applied. When adhesion has thoroughly taken place, the twisted strip of skin, by which its connection with the forehead was maintained, may be cut through, or a little strip may be cut out of it, so that it may be laid down smoothly.

Fig. 358.

Restoration of the alæ nasi.

The *septum* or *columna nasi* is often restored by the same operation with the nose itself, by means of a flap from the forehead; but it is better, as Mr. Liston proposed, to form it out of the upper lip at a subsequent operation. A strip is cut from the centre of the upper lip, a quarter of an inch in breadth, and of its whole thickness. The frænulum having been divided, this strip is turned up, but not twisted; and its labial surface having been pared off, and the inside of the apex having been made raw, the two latter surfaces are united by the twisted suture, and the wound of the lip is also united by the same. During the cure, the

nostrils must be kept of their proper size by introducing silver tubes occasionally.

When *one ala nasi alone* is destroyed, a portion of integument may be measured out on the cheek, and be raised to supply the deficiency. But if both alæ are lost, or if the cheek be spare and thin, it is better to supply their place with skin brought from the forehead. The slip which connects the engrafted portion with the forehead will of course be long and thin; and in order to maintain its vitality, a groove may be made to receive it on the dorsum of the nose. But when union has occurred, this connecting slip may be raised and cut off, and the groove which contained it be united by sutures.

Depression of the apex of the nose is to be remedied by raising the parts, dividing any adhesions that may have formed, making, if necessary, a new *columna*, in the manner described above, and supporting the parts carefully with plugs of lint, till they have acquired firmness. But it may be done still more completely by a method which was proposed by Dieffenbach, and a modification of which has been practiced with great success by Mr. W. Fergusson. "The point of a small scalpel," says Mr. Fergusson, "was introduced under the apex, and the alæ were separated from the parts underneath; next the knife was carried on each side between the skin and the bones, as far as the infra-orbital foramen, taking care not to interfere with the nerves, when, by passing the point of my finger below the nose, I caused the latter organ to be as prominent as could be wished. I now passed a couple of long silver needles, which had been prepared for the purpose, with round heads and steel points, across from one cheek to the other, having previously applied on each side a small piece of sole leather, perforated with holes at a proper distance; then I cut off the steel points, and with tweezers so twisted the end of each needle, as to cause the cheeks to come close to each other, and thus render the nose prominent. Thus, by bringing the cheeks more into the mesial line, a new foundation, as it were, was given to the organ. Adhesion occurred in some places, granulations in others; in the lapse of ten days the needles were withdrawn, and in the course of a few weeks, when cicatrization was complete, the nose presented as favorable an appearance as could reasonably have been desired.

Depression of the ridge, owing to the loss of the ossa nasi, may be remedied by paring the surface, and covering it with a flap of skin from the forehead; or by making a longitudinal incision, and engrafting a small portion of skin from the forehead into it; or, if the case is slight, by cutting out one or two *transverse* slips, and bringing the cut edges together by sutures, so that thus the surface may be stretched to its proper level.

Syme's Method.—The late Prof. Syme, of Edinburgh, devised an ingenious operation for the restoration of the nose, taking flaps of skin from the cheeks, uniting them in the middle by sutures, and fixing their outer edges to raw surfaces previously prepared at a suitable distance from the nostrils.

Wood's Method,—Mr. John Wood has restored the nose by taking lateral flaps from the cheeks, and uniting them over an inverted flap, derived from the upper lip and elongated by splitting its mucous from its cutaneous surface, from the root of the flap to, but not through, its free border.

Operation for Depressed Nose.—The nose may be flat and sunken from disease of its bones and cartilages, without external ulceration. Fergusson, modifying a proceeding of Dieffenbach's, remedied a deformity of this kind by separating the soft parts from the subjacent bones with a narrow knife, introduced within the nostril, and then bringing the whole organ forward by passing long steel-pointed silver needles across from cheek to cheek, and twisting them over a piece of perforated sole-leather. A columna was subsequently formed in the way already described.

Treatment.—Nothing answers so well as dry lint for the dressing of these cases, unless it be lint just moistened with a very dilute solution of tinct. *Calendula* (one fluid drachm to one pint of water), which has an anti-inflammatory agency, and tends also to prevent suppuration. For five or six days the wound should be left undisturbed, unless hemorrhage or sloughing should unfortunately ensue. After this the surgeon must be guided by circumstances as to the frequency and character of the dressings.

SECTION V.

OPERATIONS ON THE LIPS.

Contraction, or even Closure, of the Buccal Orifice is occasionally met with as a congenital affection, or may result from the cicatrization of a burn, etc. The deformity may be remedied by a plastic operation, the details of such a procedure varying, of course, with each particular case. As a rule, the skin and mucous membrane should be separately divided, in the direction in which it is meant to enlarge the mouth, the cut surfaces being then pared and the mucous membrane everted, so as to form a new prolabium.

Hypertrophy of the Lips may depend upon the existence of the scrofulous diathesis, or may be caused by the irritation produced by fissures or ulcers. In some rare cases, hypertrophy exists without any apparent cause, and under such circumstances the surgeon may be called upon to retrench the pouting lips, which, however charming in poetry, may, in real life, by the resulting deformity, occasion their owners no little annoyance. The operation consists in making two transverse incisions, so as to remove a sufficient slip from the thickness of the part, and then approximating the edges with delicate sutures. A similar operation may be employed to relieve the deformity known as *double lip*.

Tumors of the Lips.—Cystic tumors should be removed by careful dissection, mere excision of a part of the cyst-wall not being sufficient in this locality.

Erectile or vascular tumors of the lip may be treated by the application of caustic, by ligation, or by excision, according to the size of the growth and other circumstances of the case.

Epithelioma.—The *lower* lip is the favorite seat of epithelioma, though the disease occasionally attacks the upper lip. Epithelioma (which in this situation constitutes the affection commonly known as cancer of the lip) may begin either as a wart, or as an indurated fissure. It is much commoner in men than in women, rarely occurs before fifty years of age, and appears in many instances to be predisposed to by the use of a

short pipe. This affection is to be *diagnosticated* from rodent ulcer, lupus, and labial chancre. *Rodent ulcer* is as rare in the lower as epithelioma is in the upper lip, while *chancre* may be distinguished by the *early* implication of the neighboring lymphatic glands, and by the effect of anti-syphilitic treatment, which should always be tried in a doubtful case. The diagnosis of epithelioma from *lupus* may occasionally be very difficult, and indeed a lupous ulcer may sometimes become the seat of a true epitheliomatous formation. Lupus is, however, essentially a local disease, and does not involve the neighboring glands. The *prognosis* of epithelioma in this situation, if left to itself, is extremely unfavorable, death eventually ensuing from pain and exhaustion, or, if the disease extend to the neck, perhaps from hemorrhage. On the other hand, if submitted to early and thorough extirpation, the chances of permanent recovery are more favorable than in almost any other case of malignant disease.

The *treatment* consists in free excision with the knife, which is in almost all cases preferable to the application of caustics. As in some instances an ordinary ulcer may be so irritated by the presence of a broken tooth, or by the accumulation of tartar, as to assume an epitheliomatous appearance, any such sources of irritation should be first removed, when, if non-malignant, the ulcer will quickly heal under simple applications. Glandular implication does not necessarily forbid the excision of an epithelioma, provided that the affected glands are so situated as to render their own removal possible.

The *operation* must be modified according to the exigencies of each individual case: in most instances a simple V-shaped incision will be sufficient, an assistant compressing the lip and thus restraining the bleeding, while the surgeon transfixes the part from within, and cuts from below upwards, taking care to remove with the diseased part a wide margin of healthy tissue; the cut surfaces are then brought together with harlip pins, one of which serves to acupress the labial artery, while the accurate adjustment of the prolabium is secured by the introduction of a delicate metallic suture. If a considerable extent of the margin of the lip be involved, it may be better simply to shave off the diseased portion, the mucous membrane being then brought for-

ward, as advised by Serres, and stitched to the skin, so as to form a new prolabium. When a large portion of the lip has been removed, it may be necessary to close the gap by means of a *cheilo-plastic* operation. In all cases, advantage may be obtained by freely dissecting the lip from its attachments to the jaw.

Cheiloplasty.—Various operations for restoration of the *lower lip* have been practiced, the most generally applicable being, probably, those recommended by Malgaigne, Serres, Mutter, Buchanan, and Syme. The operation practiced by Chopart, consisted in the dissection of a quadrilateral flap from beneath the chin, as far as the position of the hyoid bone, this flap being then brought forward and attached in the normal position of the lip, while the head was flexed on the chest to prevent tension.

Mr. Syme has introduced an operation by which the cancerous ulcer of the lower lip having been removed in a triangular form, by two incisions extending from the angles of the mouth to the chin, the cuts are carried obliquely downward and outward, on each side, under the body of the jaw, and made to terminate in a slight curve outward and upward (Fig. 359). The flaps thus formed are detached from their subjacent connections, and the whole raised upward, so that the original triangular incision comes into a horizontal line, and is made to constitute the margin of the new lip; the secondary incisions under the jaw coming together in a vertical direction, in which they are retained by twisted and interrupted sutures.

Fig. 359.

Fig. 360.

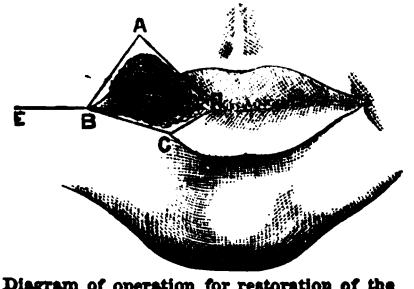


Diagram of operation for restoration of the upper lip and angle of the mouth.

Restoration of a portion of the upper lip and of the angle of the mouth may be occasionally required to remedy the destructive effect of lupus. In a case of this kind at the Episcopal Hospital, a lozenge-shaped incision, was made as seen in Fig. 360, A B C D, when, by slitting

the cheek transversely in the line B E, enough tissue was brought forward, as in Serres's operation, to close the gap in the lip, a new prolabium above and below being formed by stitching together the skin and mucous membrane. The result is shown in Fig. 360.

Harelip.—Cases of harelip are of very common occurrence in children, and require operation, not only to correct the frightful deformity they present, but to facilitate sucking. Sometimes, but rarely, they result from injury, at more advanced periods of life. In the former class of subjects, they are often complicated greatly, especially when the cleft is double, by deficiencies in the maxillary bones.

The surgeon's duty is to close the fissure, by paring its edges and bringing them together; and in so doing he must save all the tissue he can, and imitate the natural shape of the upper lip as closely as possible.

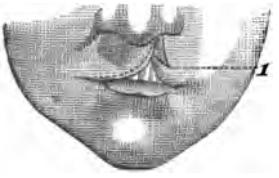
As to the time of operating, the best rule is to do it as early as practicable; it has been done successfully within the first twenty-four hours ofter birth. The instruments required are: a small scalpel or bistoury, forceps, a thin wooden spatula (a paper-knife answers very well), three or four pins, either steel or silvered, and some fine silk or linen thread. Instead of the pins, ordinary silk or wire sutures may be used.

The child should be wrapped in a folded sheet or blanket, and held on the lap of an assistant, its head well steadied on his arm. The surgeon sits in front, his instruments within easy reach; another assistant holds the end of the wooden spatula behind the lip.

With the bistoury, the surgeon now prepares the raw surfaces which are to be brought together. The old plan was simply to cut away the edges of the cleft in straight lines, but as this left the edge of the lip with an obtuse angle, concave downward, it was proposed to make the incision semi-elliptical, so as to push downward a projection in imitation of the normal shape of the part. By so doing, however, we lose some substance, and narrow the lip at the part corresponding to the middle of the incision. An admirable improvement was therefore suggested by Mirault, a French surgeon, viz., to make the incisions as in Fig.

361. One edge of the cleft is simply freshened in its whole extent; the other is cut as in the figure, being split down rather more than one-half the distance from the angle above to the border of the lip. Now by opening out this split, the little flap 1 is made to apply itself to the lower portion of the other side of the cleft, and the upper portions of both sides are brought together; thus saving tissue, and giving the margin of the lip a rounded outline as nearly normal as possible. I have adopted this plan of late, with the most satisfactory result in every case.

Fig. 361.



The manipulation needful is further shown in Fig. 362.

In cases of double harelip, the same plan may be adopted, both edges of the middle portion being simply freshened, while each of the lateral segments of the lip is divided, and the split opened out, in the manner before mentioned.

Fig. 362.

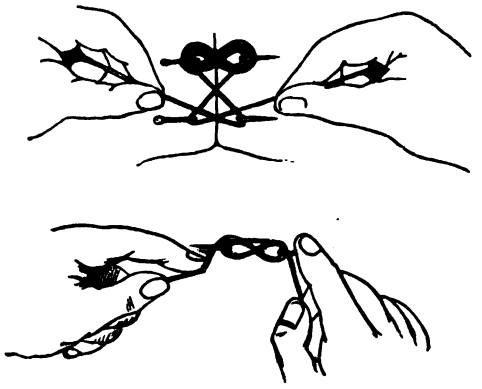


Fig. 362 shows the result of bringing together the raw surfaces by means of the suture called, from its application to these cases, the *harelip* suture.

Some authors advise the insertion of a fine silk suture, through the mucous membrane only, as an aid to that made with the pins; and it is no doubt an additional means of safety.

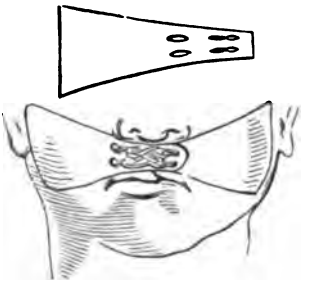
Other authors, among them the late Dr. J. Mason Warren, of

Boston, advocate the use of the ordinary interrupted suture instead of that made with the pins, on the ground of its being equally secure, and less apt to give trouble by its excoriation.

When, as sometimes happens, there is profuse hemorrhage from the coronary arteries, upon the section being made, one of the pins or sutures may be passed just at the level of the bleeding vessel, which is thus transfixed, and closed.

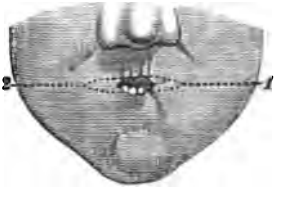
The operation being completed, a piece of adhesive plaster, or of the finest gold-beater's skin, shaped as in the cut, Fig. 363, should be applied on either side, the tips of each pin, if pins are used, being taken into the button-hole openings, and the wide part spreading out over the cheek. When the interrupted suture is employed, the same purpose is answered by merely cutting out a a dumb-bell-shaped piece of adhesive plaster, the narrow portion being applied over the lip, and the wide ends taking hold on the skin of the cheek. The object of this is of course merely to give support to the sutures, and afford additional security against any separation of the newly-apposed edges.

Fig. 363.



In Fig. 364, is represented a contraction of the mouth, and the lines of incision in Dieffenbach's operation for its relief. On either side the skin and subcutaneous tissues are cut away down to the submucous layer; the mouth is then extended outward in each direction by a straight cut, so as to make it a slit instead of an orifice. The mucous membrane is now turned out so as to imitate the normal lip, above and below on each side, and its edges fastened to those of the skin by means of sutures.

Fig. 364.



Any irregularities in the position of the contracted orifice must be provided for by modifying the extent or direction of the cuts, and in so doing the surgeon must use his judgment in each case.

Primary union is usually obtained without difficulty in cases of

harelip operation, but if it should fail (which may happen from too early withdrawal of the pins, or from a depressed state of health in the patient), the surgeon should not despair, but should re-approximate the parts, in hope that union of the granulating surfaces will occur; in this way a much more satisfactory result has been obtained than might at first have been anticipated. If it be necessary to repeat the entire operation, an interval of at least a month should be allowed to elapse, in order that the parts may have time to return to a healthy condition.

After the operation for harelip, the child, if an infant may be allowed immediately to take the breast, the action of sucking tending rather to keep the parts together than to separate them; if already weaned, abundant nutriment in a fluid form should be supplied, and may be most conveniently administered with a spoon.

For further information with regard to the treatment of harelip, the reader is respectfully invited to refer to the chapter on this subject in Mr. Holmes's well-known work on the Surgical Treatment of Children's Diseases, where will be found an excellent account of the more complicated forms of the affection, and of the special operations required for each.

Congenital Fissure of the lower lip is occasionally met with, as is the same deformity at the *angle of the mouth*, where it constitutes the affection known as *macrostoma*; these rare conditions require to be treated on precisely the same principles as those which have been laid down for the management of ordinary harelip.

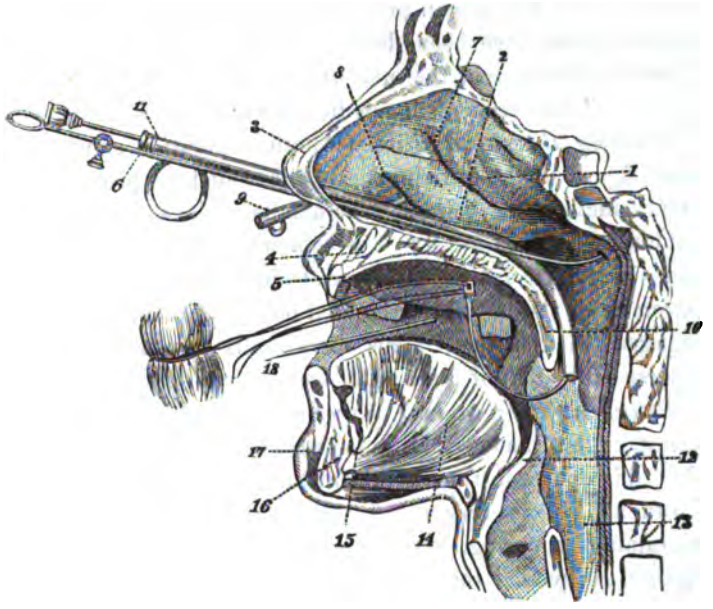
SECTION VI.

OPERATIONS ON PARTS WITHIN THE NASAL CAVITY.

Surgical Anatomy.—Fig. 365 represents a vertical section of the face in the median line, exposing the right nasal cavity, the right half of the mouth, pharynx and larynx.

1, the middle turbinated bone; 2, the inferior; 3, the cartilaginous portion of the nose; 4, edge of the palate-plate of the right upper maxillary bone; 5, the hard palate or roof of the

Fig. 365.



mouth; 7, middle meatus, and 8, inferior meatus, of the nose; 10, section of the soft palate; 12, section of the epiglottis cartilage; 18, pharynx laid open; 14, section of the tongue; 15, origin of the genio-hyoglossus muscle, one of the intrinsic muscles of the tongue; 16, section of the lower jaw; 18, section of the soft structures forming the chin.

Four operations are represented in Fig. 365.

Catheterism of the Eustachian tube.—The catheter used by Toynbee was "not quite so large as an ordinary crowquill;" but its outer extremity was larger, so as to admit the nozzle of a syringe, or the end of the tube called the *explorer*. (For these accessories, as well as for the circumstances requiring the operation, etc., the reader is referred to works on aural surgery.) In order to pass the catheter, the surgeon places the patient opposite him, and introduces the instrument, its concavity downward, into the nostril of the side to be examined; it is made to glide backward, by the side of the septum, until its point reaches the mucous membrane at the back of the pharynx. Now, being withdrawn slightly, and rotated on its long axis so as to bring its

point upward and outward, the latter will become engaged in the orifice of the Eustachian tube, and will no longer rotate freely. Various plans have been devised for retaining the catheter, either for dilatation of the tube when strictured, or for the greater freedom of the surgeon's hands in injecting liquids or air.

Probing the nasal duct.—Another operation shown in the same figure is the introduction of the sound or probe into the nasal duct from below. The handle of the sound, known as Laforest's, is seen at 9; it is somewhat irregularly S-shaped, and its shaft is to be traced just under the anterior extremity of the inferior turbinated bone, the point being already engaged in the duct. This operation is now almost entirely superseded by that of puncturing from above.

Plugging the posterior nares.—This procedure is not often necessary, but is sometimes indispensable, to arrest hemorrhage. For this purpose the instrument known as Bellocq's canula, shown at 11, is very useful. It consists of a curved tube containing a spring, with an eye at its extremity. A double ligature is passed through this eye; the tip of the instrument is then carried along the floor of the nostril, down the posterior surface of the uvula; and the spring being projected, starts forward into the mouth. Now, catching the ligature with a forceps, or hook, the surgeon draws one end of it out through the mouth, ties a pledget of charpie or lint to it, and then retracts the spring. By pulling upon the end of the ligature, which is still hanging out of the nostril in front, the pledget is brought close to the end of the canula, which, being retracted, acts as a guide to conduct the pledget to its desired position in the posterior part of the nose. The instrument is now readily withdrawn through the nostril, by slipping it forward along the ligature, which is finally freed from the eye at the end of the spring, and fastened by a strip of adhesive plaster to the cheek, so as to prevent the pledget, if loosened in any way, from falling into the throat.

Upon an emergency, this operation may be done with a piece of curved wire looped at the end, the forefinger being introduced into the mouth to catch and guide it forward from behind the uvula. All other points of the procedure are done in the way before described. It has been imperative under emergencies to

use the eyed probe of the pocket case for this purpose; but it is hardly long enough to answer well.

Polypus of the nose.—This very troublesome and disgusting affection may occasionally be removed by medicines. But it sometimes requires an operation for a permanent cure.

Somtimes the growth may be twisted or torn away with forceps, astringents being afterwards employed to complete the cure. Or, by means of a double canula, a ligature may be cast around the base of the growth, and tightened so as to strangulate it.

In one case, where this plan had been repeatedly adopted without permanent success, Dr. Mott removed a portion of the bone, so as to get at the root of the growth; he had the satisfaction of effecting a cure.

Operations of this kind are far easier in theory than in practice, the difficulties arising from the obscurity of the parts, and the very confined space to be worked in. Sometimes they may be simplified by rhinoscopic examination; but this in itself requires no small skill and experience to be in any degree satisfactory.

Lipoma is a hypertrophied condition of the cutaneous and subjacent cellular tissues of the nose, forming a red or purple, soft, lobulated mass, and causing great deformity. Anatomically, the disease should be classed as a fibro-cellular outgrowth. The sebaceous follicles of the nose often appear to be the parts principally involved. Fig. 366. The *treatment* consists in excision, the only point in the operation requiring any particular attention being not to lay open the nostril; the occurrence of this accident may be avoided by causing an assistant to distend the part with a forefinger, that he may warn the surgeon if the knife penetrate too deeply. There is usually a good deal of hemorrhage, which may be checked by the application of cold. Healing takes place by granulation and cicatrization.

Fig. 366.

Imperforate Nostril.—This is occasionally, though rarely, met with as a congenital deformity; if the obstruction be not too deeply seated, it may be removed by incision and subsequent dilatation with bougies.

SECTION VII.

OPERATIONS ON THE TONGUE.

Removal of the Tongue.—Removal of a part or even of the whole of the tongue is sometimes rendered necessary by morbid growths in its substance, or by partial hypertrophy. Prof. Syme, of Edinburgh, and others, have excised the whole organ, and with success.

The method for partial removal, by cutting, may be thus described. A pair of vulsellum or toothed tumor forceps, being made to take firm hold of the tip of the tongue, the organ is drawn forward so as to expose the whole of the disease, and the incisions are made on either side with a strong pair of scissors cutting from without inward. An assistant steadies the tip of the tongue by means of the forceps.

When the knife is used instead of scissors, the cuts may be made by transfixion, the back of the knife being kept toward the mouth. If the tongue is strongly drawn out, the point of the bistoury may be entered from below, which is safer than carrying it from above downward.

Upon the completion of the removal in either way, there is apt to be very free bleeding, which may be checked by the ligature, by torsion, *Gossypium* lotion or by the actual cautery.

Finally, the cut edges are to be carefully brought together by means of sutures, passed deeply into the muscular substance. For several days the patient must be nourished with liquid food, of the most nutritious kind, such as beef tea, strong soups, etc., so that but a small quantity need be taken at once.

The removal of the entire tongue may be accomplished in several ways. Mr. Syme's method was by dividing the lower lip in a vertical line, nearly to the hyoid bone, sawing through the jaw at the symphysis; having cut the attachment of the genio-hyoglossi muscles, and the two halves of the bone being held

apart, he then cut through the hyoglossi muscles and the mucous membrane covering them; the tongue was now drawn forward, and the lingual artery on either side was cut and ligated, after which the division of the organ close to its root was an easy matter. Some small arteries required tying, and then the edges of the wound were brought together with silver sutures, except at the lower extremity, where the ligatures were allowed to hang out in order to drain away the liquids from the mouth.

Sedillot proposed the sawing of the bone somewhat irregularly, so as to make it easier to keep the two portions in apposition afterward; the saw being carried first a little toward the right, half way down through the bone, and then toward the left for the rest of the section. This is a very valuable suggestion.

Regnoli's operation is by an incision, dividing all the tissues, drawing down the tongue, and severing it either with the knife or with the ligature. This would hardly afford the needful space in a case of extensive disease.

Nunneley's operation reduces the incision to a mere puncture. This surgeon takes a broad curved needle about four inches long, and carries it up through the floor of the mouth in the median line. The needle is armed with a ligature, the end of which is tied round the middle of the chain or wire rope of an ecraseur; thus, when the ligature is brought up into the mouth, it brings a loop of the chain along with it. Two or three long and strong pins or needles are next thrust through the tongue from below upward, and from its anterior attachment to points on its upper surface close to its root. Now, casting the wire loop back of these, and tightening it, the substance of the organ is of course compressed. Full anæsthesia is now induced, and, by the action of the ecraseur, the tissues of the tongue are cut through.

Paget merely divides the anterior attachments of the tongue, draws it forward, and casts the wire around it.

Colles proposes a section through the cheek, the tongue being hen transfixed near its root by means of a strong needle with an eye near its point, carrying a ligature. This being once seized, the needle is withdrawn, and the loop divided; by means of its two portions two ecraseurs are brought to bear, one cutting through the anterior and the other through the posterior portion of the tongue.

The entire tongue may, however, be removed in some cases, without incision of the cheeks or chin, by opening the mouth widely, drawing the tongue upward and forward, passing three or four needles through it backward in a radiating manner, entering them at the frænum and causing them to emerge on the dorsum close to the root, and then casting the loop of the ecraseur around the base of the organ. When tightened, the loop is prevented from slipping forward by the needles; if the latter are curved, and the convexity of the curve kept downward, the ecraseur will divide the tongue-substance nearer to the floor of the mouth than if the needles are straight. If any diseased portion is left, the knife or scissors must be used.

Complete Extirpation of the Tongue was first performed by Syme, of Edinburgh, and has since been repeated by Fiddes, Nunneley, Heath, Annandale, and others—Syme, Fiddes, and Annandale having employed the knife, and Nunneley and Heath the *ecraseur*. Whichever instrument be chosen, access to the organ may be facilitated by Symes's plan of dividing the lower lip and the symphysis of the jaw, the parts being wired together again after the completion of the operation. Nunneley's experience in extirpation of the tongue appears to have been unusually large; he has, he declares, done the operation nineteen times "without any untoward symptom following in a single instance."

These operations are all dangerous in themselves, and are seldom productive of more than temporary benefit; they are of course only applicable to cases in which the disease is limited to the tongue itself, implication of the floor of the mouth or of the neighboring lymphatic glands being a positive contra-indication. Hilton and Moore have recommended as a palliative measure, in cases not admitting of excision, the *division of the gustatory nerve*—an operation which may also be resorted to as a preliminary to the application of ligatures. The nerve may be reached just behind the last molar tooth, by an incision crossing its course, made from within the mouth, and carried freely down to the bone.

Ligation of the lingual artery has been also practiced as a means of arresting the progress of malignant disease of the tongue, and, according to Coote, with somewhat encouraging results.

Contrary to what might perhaps be expected, the power of swallowing is not affected by extirpation of the tongue, while speech, though at first rendered imperfect by the operation, is eventually completely restored.

Tongue-tie consists in a congenital shortening of the *frænum linguæ*, which prevents the tongue from being protruded beyond the line of the teeth. If present in an aggravated degree, this deformity may interfere with suckling, and, under any circumstances, the operation for its relief is so trifling, that it may be properly done, if, as usually happens, the parents desire its performance. The operation consists simply in dividing the frænum for about an eighth of an inch, with blunt-pointed scissors, the cut being made toward the floor of the mouth, so as to avoid the ranine vessels. There is a popular notion that tongue-tie may cause dumbness, and myotomy of the lingual muscles, through an incision beneath the chin, has even been performed, with a view of restoring the power of speech—a totally useless operation, since, as justly remarked by Holmes, the whole tongue itself may be extirpated, and yet the power of speech remain.

Tumors of the Tongue.—*Cystic Tumors* may occur in various parts of the tongue, but are most common beneath this organ, or in the floor of the mouth below the buccal mucous membrane, constituting in these situations the affection known as *ranula*. The common form of ranula has thin walls, and contains a fluid somewhat resembling saliva, whence it was formerly supposed to be dilatation of the duct of the submaxillary gland. Such, is, indeed, probably the case in some instances, as when occlusion of the duct is caused by the presence of a salivary calculus; but the majority of ranulæ appear to be distinct cystic formations, analogous to those which are met with in other organs. The ordinary form of ranula may be treated by the formation of a seton, or by excision of a portion of its anterior wall, the cavity being subsequently allowed to heal by granulation. That variety of the disease which is met with between the floor of the mouth and the mylo-hyoid muscles, often forms a more decided prominence in the neck than in the buccal cavity, and hence would appear to be most accessible through an external incision. The risk of hemorrhage, however, in any attempt at

complete extirpation, is so great, that it is as a rule, better to lay open the tumor from within, and turn out its contents, thus converting the cyst into an abscess, the healing of which may be promoted by stuffing the cavity with lint, wet with *Calendula* lotion.

Erectile and Vascular Tumors are occasionally seen in the tongue, and may be treated by the ligature, by excision, or by strangulation with the *ecraseur*, according to the size and situation of the growth.

Fatty and Glandular Tumors of the tongue may be treated by excision, the organ being drawn well forward with a tenaculum or cord passed through its tip. Hemorrhage in these cases is sometimes rather troublesome, but may usually be arrested by passing a metallic suture deeply around and across the bleeding point by means of an ordinary nævus needle or one with a spiral extremity. Excision would appear to be a safer operation than ligation, in cases of tumor involving the root of the tongue. Apart from the risk of inflammatory swelling and œdema of the glottis, which attends the use of the ligature in this situation, severe or even fatal cerebral complications may be developed as reflex phenomena (as in a case recorded by Hunt), from injury to fibres of the glosso-pharyngeal nerve.

Malignant Tumors of the Tongue are almost invariably of an *epitheliomatous* character, though true lingual *cancers*, both of the scirrhous and encephaloid kinds, are described by systematic writers. The only treatment which offers any prospect of benefit, consists in removing the diseased mass, which, when a portion only of the organ is affected, may be accomplished by the application of ligatures, as in cases of nævus, or by excision, which is the preferable operation when the tip only is involved.

Wounds of the Tongue are liable to be attended with severe hemorrhage from the lingual artery or from veins. If the bleeding orifice cannot be otherwise tied, one or more ligatures must be introduced with curved needles, so as to include and constrict the bleeding parts, or a heated iron may be applied. Children are apt to inflict very severe bites, even sometimes almost biting off the end of the tongue. In such cases surgeons put themselves to very great trouble to introduce sutures, but the patient fares none the better.

SECTION VIII.

OPERATIONS WITHIN THE MOUTH.

Abscess of the Gums (*Gum-boil, Alveolar Abscess*) is a common affection, resulting from the irritation of necrosed or carious teeth. The abscess forms in the socket of the tooth, and may extend inwards—bursting through the gum—or may spread outwards through the cheek. In the early stage of a gum-boil, the application of hot *Aconite* lotion to the inflamed gum will often afford great relief from pain, and may even prevent the occurrence of suppuration; if, however, pus have actually formed, it should be evacuated by an early and free incision, made from within the mouth as soon as fluctuation can be detected in that position. As it is very desirable to avoid the deformity caused by an external opening, an effort should be made to obtain resolution on the side of the cheek, pointing being at the same time encouraged within the mouth. For this purpose it will usually be advisable to avoid the use of poultices, substituting an embrocation of the extract of *Belladonna*, diluted with *Glycerine*. The patient may be at the same time directed to wash out the mouth frequently with warm *Aconite* water, or the domestic remedy of a hot fig may be applied to the inner side of the inflamed gum. As soon as the acute symptoms have subsided, whether by the occurrence of resolution or of suppuration, the services of a dentist should be invoked, to remedy the diseased state of the offending tooth, and thus avert a recurrence of the affection.

Lancing the gums is a little operation often required in cases of difficult dentition. It is most conveniently performed with the instrument known as the "gum lancet," though, in an emergency the small blade of an ordinary penknife will serve the purpose perfectly well. The child's hands should be restrained by the mother or nurse, while the surgeon, separating the jaws with the left forefinger, introduces the blade of the lancet guarded with the right forefinger; this serves to guide to the point at which the incision is to be made, and at the same time keeps the child's tongue out of the way of injury from the knife.

Epulis.—This is a general term signifying an outgrowth of

the gum, the growth in these cases being rather of the nature of a continuous hypertrophy than of a distinct tumor. The ordinary epulis is of a fibrous structure, but myeloid, cancerous, and epitheliomatous growths are also met with in this locality. The disease chiefly affects the lower, but is also met with in the upper jaw, rarely occurs before adult life, and is equally common in either sex. It is usually traceable to the irritation produced by a decayed tooth. The *Fibrous Epulis* appears as a red, smooth, lobulated mass, caused by the natural structures of the gum, the mucous glands of which are sometimes abnormally developed. The growth is at first firm and resisting, but may become softened by central disintegration, or may ulcerate superficially. The *Malignant Epulis*, as it is commonly though improperly called, is usually of a myeloid character; in some instances, however, as already observed, these growths are really malignant, being of an epitheliomatous or cancerous nature. The malignant differs in appearance from the simple or fibrous epulis, in being softer, of a darker color, more vascular, and of more rapid growth, and in its tendency to recur after removal.

The only available mode of *treatment*, in any case of epulis, is excision, and as the growth commonly involves the periosteum, this, with a thin layer of the subjacent bone, should be removed with the gouge-forceps, so as to prevent a recurrence of the disease. In ordinary cases, the whole operation may be done from within the mouth, but if the tumor be large, and particularly if of a myeloid character, it may be necessary to make an incision through the median line of the lip, and then dissect off the cheek so as to freely expose the whole growth. A tooth should be extracted on either side of the diseased mass, and the alveolus divided with a strong but small saw as far as the base of the tumor. Cutting pliers, with the blades at a right angle to the handles, are then to be applied, one blade on either side of the jaw, when the whole growth, with the bone from which it springs, can be readily cut away. The *base of the lower jaw* should always be allowed to remain, in order to preserve the symmetry of the part: the removal of the whole thickness of the bone appears to be quite unnecessary, epulis, according to Heath, never involving the lower border of the jaw. If the bone be very

thick, it may be desirable, before applying the cutting forceps, to make a horizontal groove with a Hey's saw; but in most instances this will probably be found unnecessary. Hemorrhage is to be checked by compression, *Gossypium* lotion, or, if this fail, by the use of the actual cautery, or of Monsel's solution of iron; the external wound, if one have been made, being then accurately adjusted with harelip pins and the twisted suture. The bleeding is often profuse, in operations for the removal of malignant epulis, requiring the free use of the hot iron; in these cases, also, it may be necessary to remove the entire thickness of the bone, by means of an external incision beneath the horizontal ramus of the jaw.

Excision of the Tonsils.—When surgical interference for the removal of enlarged tonsils becomes necessary, an expert operator can accomplish the object by grasping the tip of the gland with a pair of vulsellum forceps, and shaving it off with a bistoury (wrapped to within about an inch of its point, lest the tongue or lips should be wounded). The forceps are required, in the first place to steady the gland and draw it slightly out of its bed between the half-arches, and secondly to prevent the piece cut off from dropping into the larynx.

The great risk of this method of excising the tonsil is that of making too much use of the forceps, so as to drag the internal carotid artery into the track of the knife. Should this accident happen, instant ligation of the primitive carotid would be the only means of saving the patient; and even then he would probably fall a victim to secondary hemorrhage.

A far safer plan is that by means of a special instrument called a tonsillotome, of which the simplest form is the one devised by Physick. This consists of a ring to surround the tip of the tonsil, and a prong to fix it, while a sharp guillotine-like knife is thrust forward within the ring and divides the tissue before it. The handle is sometimes set on at an angle, so as to be out of the way not only of the operator's sight, but of the other parts of the instrument.

Staphyloraphy, or sewing up the palate, is an operation for the closure of clefts of the roof of the mouth and velum palati. In the majority of cases, the fissure concerns not only the soft parts, but the bone; the palatal portions of the upper maxillary and palate bones being deficient at the median line.

As a general rule, it is better not to do this operation in children, but to defer it until the patient is able to appreciate its importance, and to exert the needful self-control. Anæsthesia should either be dispensed with altogether, or induced only after the incisions have been made and the bleeding checked; otherwise the amount of blood swallowed may give trouble.

The steps of the operation are: the separation of the soft parts, including the periosteum, from the bone; the freshening of the edges of the cleft; the division of the posterier pillars of the fauces; the introduction of the sutures; and the approximation of the edges.

At least two assistants are required, one to steady the head, and the other, who should be skillful and experienced, to hand the instruments (with which he should be thoroughly familiar), and to aid in the adjustment of the sutures. Another is needed to give the anæsthetic, if such is used.

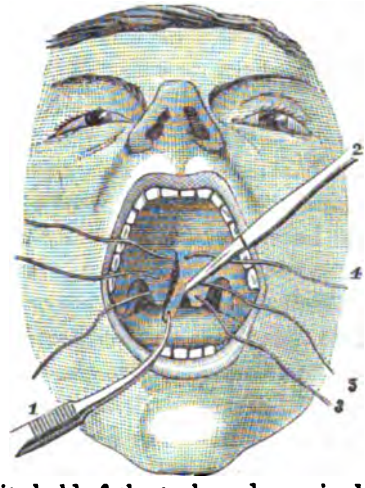
The instruments necessary are: two scalpels, with long handles and short blades curved on the flat, one to the right and the other to the left; or one of like shape but double edged; two strong bone knives, also curved on the flat, and with long handles; one or two pair of long, curved, toothed forceps; a pair of long scissors, curved on the flat; very short, curved needles, armed with suture threads, and needle-carrying forceps; one or two knot-tiers, with forked ends, or an instrument to carry the needles, if wire sutures are employed. Half a dozen small sponges, each tied firmly at the end of a piece of whalebone eight inches in length, will be useful. A small vessel with a strong solution of *Gossypium*, or some other active styptic, should be at hand.

From time to time, very complicated needle-carriers have been devised for the performance of this operation, and variously-shaped knives and scissors proposed. I shall not undertake to enumerate these; the apparatus mentioned above is amply sufficient.

For some weeks before the operation is attempted, the patient should practice himself in keeping the mouth widely opened for a length of time, and accustom the fauces and palate to being touched.

Operation.—The patient being seated in a strong light, his head firmly supported against the breast of an assistant, the surgeon begins by paring the edges of the cleft. Pancoast's method of doing this is the best.* With a pair of forceps in his left hand, he "takes hold of the uvular margin of the right portion of the velum, and puts it on the stretch. The point of the double-edged knife is then to be entered just above the point of the forceps, from before backward, and the knife (edge) carried up a line above the apex of the fissure, so as to detach the rounded border of the fissure in a narrow strip. Fig. 367. The knife as well as the forceps is then withdrawn, leaving the strip as yet adherent at its upper and lower ends, so as to leave no floating point to irritate the passages. The patient is now to rinse out the mouth. A similar operation is then done on the opposite margin of the fissure; but this time the knife is run up to cut into the former incision near its top, and then brought down so as to detach the lower end of the loosened strip by cutting at the outer side of the hold of the forceps. The forceps, which retains its hold of the A-shaped marginal strip, is now retracted so as to straighten out the piece, which remains attached only at the point of the uvula of the left side, from whence it is at once to be separated with the point of the knife."

Fig. 367.



The next step is to free the velum on both sides, so that the edges may readily come together. This is done with the curved scissors, by cutting the edge of the anterior pillar of the fauces, where it spreads out into the side of the velum. Warren† says that there is sometimes a firm, resisting mass of tissue extending

* Operative Surgery, p. 260.

† Surgical Observations, with Cases, p. 128.

above and behind the velum, which also requires division by a stroke or two of the scissors.

Now, the edges of the fissure being readily approximated, it remains to fasten them together. In order to pass the sutures accurately, it has been generally recommended to carry them on both sides from before backward, and ingenious plans have been devised for this purpose. But with a good pair of forceps, properly grooved so that the needle can be securely held at either of several angles, and with fine, short, sharply-curved needles, most surgeons may venture to pass the sutures from before backward on one side, and then from behind forward on the other. Or, on one side the suture may be traversed from before backward, the needle drawn through and out of the mouth, detached, and the thread left thus hanging; next the needle, armed with a *single* strand untwisted from ordinary saddler's silk, is passed on the other side of the cleft, also from before backward; now, by knotting this last very slender thread to the end of the suture silk, the latter may be drawn through from behind forward, and will be in place.

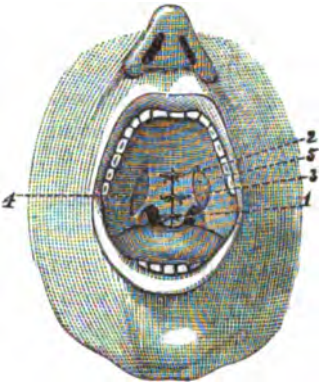
Warren recommends the introduction of the middle suture first, the upper one next, and lastly the lower one. Four are not often needed. He also speaks of soaking the silk in compound tincture of *Benzoin* for a day or two before using it; it is thus rendered less apt to slip.

The sutures being accurately introduced, are, if of silk, to be tied, which may be done either by pushing the knot down with both forefingers, introduced back to back into the mouth, while the threads are drawn upon by the thumb and remaining fingers of each hand, or my means of a *knot-tier*, or long probe with a broad cleft end. One knot being tied, it should be at once grasped with a pair of forceps, and held while the second is made. The great object is to bring the opposite edges of the fissure into absolute contact with each other without much tension.

When wire is used, the two ends are passed through the hole in the instrument, which is then pushed up along them so as to bring them close together at the cleft. They are then twisted, which is easily done by means either of a long pair of forceps or

by the fingers alone, and cut off as short as may be judged proper. Fig. 368.

Fig. 368.



When the fissure concerns the hard palate,—the bony roof of the mouth as well as the soft textures,—it is necessary to detach the periosteum along with the soft parts. This is done with the long-handled curved bone-knives, after the cutting of the soft parts has been completed; and the subsequent steps of the operation do not differ from those formerly described.

Upon closing the fissure, a firm fibrous basis is thus given to the the mucous membrane, and in favorable cases a deposit of bone may also occur. The sutures, as a rule, should not be removed until the eighth or tenth day, and then one or two at a time—the patient during the interval being fed on liquid but nutritious food, and kept as quiet as possible, though not necessarily confined to bed.

After the operation, the voice is occasionally observed to have undergone immediate and decided improvement, but in most cases, at least in adults, a considerable length of time and a long course of vocal gymnastics will be found necessary to restore distinct articulation.

Uranoplasty.—The merit of first devising an operation for the cure of fissure of the hard palate, is due to the late Dr. J. Mason Warren, of Boston, who published an account of his procedure in 1843. His plan was to dissect up, with a long double-edged knife curved on the flat, the mucous covering of the hard palate, beginning on either side of the fissure, and carrying the dissection back to the alveolar processes; the pendulous flaps thus formed were then united in the median line. Another plan, which Fergusson prefers, is to make an incision parallel to the alveolus on either side, and carry the dissection toward the free margin of the fissure. Langenbeck uses a blunt instrument, with which to separate the periosteum from the bone, in order to take

advantage of the osteo-genetic power of that membrane; and his operation, which has been frequently performed in Germany, has been successfully repeated in this country by Dr. Wm. R. Whitehead, of New York, who published an excellent paper on the subject, with an analysis of fifty-five cases, in the *American Journal of Medical Sciences*, for October, 1868.

It is a disputed point amongst surgeons, whether, in dealing with a fissure of both hard and soft palate, an attempt should be made to close the whole gap at once, or whether the operation should be divided between several sittings: no positive rule can be given upon this point, but Holmes's advice appears judicious, viz., to be content with closing a portion of the hard palate at the first operation, provided the parts come easily together, but if it should be found necessary to detach the soft parts through the whole extent of the cleft, then to attempt complete closure at one operation. According to T. Smith, if *staphyloraphy* be performed at an early age, the fissure of the hard palate will subsequently undergo contraction to such an extent as to render it possible, in most cases, to dispense with any further operation.

In cases of cleft palate not admitting of surgical treatment, and in most cases of *Acquired Perforation of the Hard Palate*, particularly as the result of syphilis, *obturators* of metal, ivory, or valcanized India-rubber, may be worn; one of the best instruments of the kind is that devised by Kingsley, of New York; it is provided with a soft curtain of India-rubber, to take the place of the natural velum. A judicious caution as to the use of obturators in cases of necrosis, is given by Heath. This is, that no plug should be introduced into the aperture itself, which would inevitably become still further enlarged by the pressure on its edges, but that the occluding apparatus should consist of a properly fitting plate, arching below the palate, and attached to the teeth.

Elongation of the Uvula.—This affection is usually remediable by the use of astringent gargles or caustic solutions, but, if persistent, may require a surgical operation for its relief. This operation consists simply in cutting off the pendulous part with scissors, at about a third of an inch from the root of the organ. The tip of the uvula may be seized with a pair of forceps, held in the left hand, while the scissors are applied with the right.

SECTION IX.

OPERATIONS ON THE JAWS.

Necrosis of the Jaws may result from traumatic causes, from syphilis, from the abuse of *Mercury*, or from the contact of the fumes of *Phosphorus* (as in the makers of lucifer matches); it is, moreover, sometimes met with as a sequel of the eruptive fevers, and may even occur without being traceable to any definite cause. In the upper jaw, the disease is almost invariably limited to the alveolar border, but in the lower jaw, may involve the whole thickness of the bone. The *treatment* consists in the administration of nutritous food and appropriate remedies, with the use of detergent lotions, and an *early removal of sequestra;* as long as a portion of dead bone remains in the mouth, the patient is constantly exposed to the risks of septic poisoning. Removal should, if possible, be effected without resorting to external incisions; in the upper jaw this can be readily accomplished, but, if the whole thickness of the lower jaw be involved, an incision below the ramus may be absolutely necessary; Perry and Boker have, however, each succeeded in removing the whole lower jaw, in a state of necrosis, through the mouth.

Abscess of the Antrum.—Suppuration may occur in the antrum as the result of traumatic causes, or of the irritation produced by a diseased tooth. The symptoms are those of deep-seated suppuration in general, with enlargement of the part, causing swelling of the cheek, protrusion of the eyeball, occlusion of the lachrymal duct and nostril, and bulging of the hard palate. If the accumulation of purulent matter be very great, the walls of the antrum may become so attenuated as to crackle under pressure. Pointing may take place on the cheek, or within the mouth, or the abscess may possibly discharge itself through the nostril. The *treatment* consists in making a free opening into the antrum, and, subsequently, in daily washing out the cavity by syringing with warm *Calendula* water. If one of the molar teeth be carious, this may be extracted, and an opening made by thrusting a trocar, small perforator, or, which Fergusson recommends, an ordinary gimlet, through the socket, but,

under other circumstances, it is better to make the opening through the front wall of the antrum beneath the cheek; the bone is here thin, and can be readily perforated with a strong knife or scissors. External pressure may be afterwards employed to restore the part to its original shape, and injections of *Calendula* water thrown into the cavity two or three times a day.

Cysts of the Antrum (*Dropsy of the Antrum*).—The antrum is not unfrequently the seat of a collection of thin glairy mucous, or of a brownish serous fluid containing crystals of cholestearine. The older surgeons looked upon these cases as the result of an obstruction of the orifice of the antrum, causing accumulation of the natural secretion of the part, and hence applied to them the term *hydrops antri*, or *dropsy of the antrum*. Modern pathologists, however, believe that, at least in the large majority of instances, these are examples of true cystic disease, analogous to those which are met with in other parts. The *symptoms* of a cyst of the antrum are very much the same as those which characterize the abscess of that cavity, except that no evidence of an inflammatory condition is present. The *diagnosis* is important, as these cases are curable by a very slight operation, whereas solid tumors of the antrum demand a much graver procedure for their removal; hence, in any case of doubt, the surgeon should make an exploratory puncture before resorting to more serious measures. The *treatment* of cystic disease of the antrum consists in perforating the anterior wall of the cavity from within the mouth, the cheek being previously dissected up if necessary. A small portion of the anterior wall may be excised, so as to allow thorough exploration of the part, and prevent re-accumulation. If, as sometimes happens, a *tooth* be discovered within the antrum (in which case the cyst is said to be *dentigerous*), the tooth should be removed with suitable instruments, introduced through the opening already made, and *Calendula* lotions applied as recommended above.

Removal of the Parotid Gland.—It has been questioned by some good surgeons and anatomists whether, in cases of disease of this gland, its complete removal could be effected. Without entering into the discussion of this point, we may merely say here, that in this formidable operation, when decided upon, the

same principles must be observed as in the ablation of other tumors. All the skin involved should be taken away; the diseased tissues should be patiently and thoroughly dissected out; and, as far as possible, the nerves traversing the region should be spared. Hemorrhage should be checked by tying every vessel as it springs.

Surgical Anatomy.—The parotid gland, irregular in shape, is situated just in front of and below the ears, behind the angle of the jaw; it is limited above by the zygoma. Its duct runs forward to the anterior edge of the masseter muscle, and there dips inward to open within the mouth opposite the second molar tooth of the upper jaw. The gland is traversed by the external carotid artery, which gives off the facial, just before entering it, and during its passage, the posterior auricular, transverse facial, and internal maxillary; each of these vessels has a corresponding vein. From behind forward the gland is pierced by the portio dura or facial nerve.

The submaxillary gland lies just under the edge of the lower jaw. It should be noted that the external jugular vein and the branches immediately forming it are separated from the external carotid artery by the sterno-cleido mastoid muscle; and that the submaxillary gland lies between the facial artery and its vein. In both instances the veins are superficial.

Salivary Fistula.—In this rare affection, an opening exists through the skin into the duct of Steno, and the saliva constantly flows out over the cheek. Horner's method consists in inserting into the mouth a wooden spatula, which is pressed against the inside of the cheek with the surgeon's left hand, while with the right, he first slightly enlarges the external orifice, and then drives a small punch directly through all the tissues into the mouth, against the spatula. A free passage into the mouth being thus provided for the saliva, the next step is to close the external orifice; which is done by the accurate application of sutures and adhesive strips. Until the edges are thoroughly united, it will be well for the patient not to lie with his head on the side operated on, since the saliva would tend by gravity to find its way again through the skin.

Resection of the upper maxillary bone.—This operation is

usually rendered necessary by tumors of the antrum or of the bone itself. Sometimes the entire bone has to be removed, but often the line of section may be below the floor of the orbit. The instruments required are: one or two strong bistouries and scalpels; bone nippers and forceps; instruments for arresting hemorrhage (among them cauterizing irons); blunt hooks and dilators; one or two elevators; and suture needles.

No inflammable anæsthetic, such as ether, can be used in this operation; hence chloroform is generally chosen.

The steps of this operation are: the division of the skin and subjacent tissues so as to expose the bone; the section of the bone; its removal; the closure of the wound. Bleeding is apt to occur at any stage of this procedure, and must be carefully arrested.

This is one of those surgical procedures in which expedition is highly desirable; since the hemorrhage will certainly be very free, and large quantities of blood are apt to be swallowed. During the early steps, the vessels should be quickly and carefully tied as they spring; the moment the removal of the diseased parts is accomplished, the cautery should be effectively applied where the blood is seen welling up into the chasm.

There are several ways of exposing the upper maxillary bone for removal. Perhaps the simplest possible is shown in Fig. 369,

Fig. 369.

the knife being entered at the angle of the mouth, and made to divide all the tissues of the cheek in a curved line to a point somewhat in front of the middle of the zygoma. The flap thus made may be turned up so as to give complete access to the bone. One advantage of this incision is that the vessels are cut across directly, and can be easily tied.

Another method, much more complicated, is that of Gensoul. A transverse cut is made on a level with the ala of the nose, or about the middle of the bone, and is joined with a vertical one,

extending from the inner side of the internal canthus to the angle of the mouth. Another vertical cut is made from near the outer canthus of the eye. By turning aside the three flaps, one rectangular and two triangular, thus marked out, the bone is entirely exposed. The bleeding met with in this way is somewhat less readily managed.

Another method, and a very excellent one, is to carry an incision from a point at the side of the nose about opposite the inner canthus, down along the edge of the ala to the median line, and then through the thickness of the upper lip. If the opening thus made is too small, an additional cut may be carried outward just below the lower margin of the orbit. The bleeding caused by this incision is about the same, and from the same vessels, as in the last method.

Having exposed the bone, the surgeon's next object is to detach and remove it, either wholly or in part. For this purpose, the bone nippers and forceps will almost always suffice. If the whole bone must be taken away, the palate plate is first divided (an incisor tooth being previously drawn, if necessary), by passing one blade of a strong pair of bone-nippers above, in the nose, and the other below, in the mouth. The nasal process is next divided in the same way, and then the malar; the soft parts being dissected away so as to give the bone-nippers a clear cut at the bone. A pair of cutting forceps bent at an angle, will often be found more convenient than any other; they can not only be used to more advantage, but the operator's hand is not in the way of his seeing the exact point of application of the blades.

Upon grasping the alveolar portion of the bone with a pair of Ferguson's "lion-jawed" forceps, and swaying it gently to and fro, the whole mass, with any tumor that may be attached, will generally become loosened, and be easily brought away by a few touches with a bistoury to divide the soft parts. The surgeon now explores the cavity with the finger and eye, clears it of any remaining disease, sponges it out, applies the actual cautery, and closes the wound; filling the cavity with a mesh of lint saturated with a weak solution of *Gossypium* lotion, to which a ligature is tied and left hanging out, so as to be readily withdrawn in two or three days.

If it is necessary to take away the lower part of the bone merely, leaving the orbital plate, the surgeon either enters the anterior wall of the antrum with a small trephine, or, especially if it be thinned by absorption, he may force one blade of a pair of sharp nippers through it, and then with the same instrument carry the section around the inner, outer, and posterior walls. The remainder of the operation is done as in the last case, and the mode of dressing is the same.

The wounds made in the operations of Warren and Gensoul are closed by the harelip suture. Some authors advise in preference the ordinary interrupted suture, but there is in fact not much choice between the two. There is very little stress on the edges, after the removal of so large an amount of the subjacent bony structure.

In some cases, by making the same division of the soft parts, the antrum may be entered, its anterior wall removed, and the disease extirpated, without sacrificing the palate or dental arch; a plan by which the symmetry of the face might be in some degree preserved, although the strength of the jaw would probably never be restored.

Very great relief is often given by these operations, even if a permanent cure is not effected. In 1864, Dr. Paddock removed the right upper maxillary bone of an old lady who had suffered untold agonies for many months, and for nearly two years afterward she lived in great comfort. But the importance of rapidity in operating, and especially in arresting hemorrhage, can scarcely be too much insisted upon. Twice within three months Dr. Paddock saw death ensue from excessive bleeding in cases of this kind.

A great part of the upper maxillary bone may sometimes be removed without any external incision.

In order to accomplish this object, the patient being chloroformed, and his head firmly supported, an assistant draws the upper lip and cheek away from the bone, for which purpose one or two wide metallic retractors will answer best. The surgeon now dissects away the cheek from the maxilla, beginning in front and working round toward the side, until he has exposed the anterior and lateral faces of the bone, and divided all the soft

tissues as far as necessary; he next separates as much of the bone as he intends to remove, in the same method as when external incisions are made.

The *results* of excision of the upper jaw are quite as favorable as could be expected, in view of the severity of the operation; 17 cases, quoted by Heath, from the *Medical Times and Gazette*, gave 14 recoveries and but 3 deaths. The chief dangers of the operation appear to be from *shock*, from *hemorrhage*, and (if chloroform be used) from *entrance of blood into the air-passages*.

1. *Shock* is not so much a source of risk in cases of excision of the jaw merely, as in those cases in which the jaw is removed as a preliminary step in the extirpation of retro-maxillary tumors. It is diminished by the use of chloroform, which, as the hot iron may be required in the latter stages of the operation, should in these cases be substituted for ether, on account of the inflammable nature of the latter agent.

2. *Hemorrhage* is always pretty free in these operations, during the early stage, particularly if the incision through the cheek is adopted, when the facial artery is cut at a point at which its calibre is considerable; the surgeon may, if he think proper, apply a ligature to this vessel before proceeding to the other steps of the operation, but, as a rule, the pressure of an assistant's fingers, or the application of a *serre-fine*, will suffice to control the bleeding until the whole excision has been completed At a later stage of the operation, there is again pretty free bleeding from branches of the internal maxillary, which are necessarily cut or torn across where the jaw is removed; these branches may be secured by ligation, or may be occluded by a few touches of the hot iron, which will often be found a more convenient application, in this situation. In order to prevent hemorrhage during the operation, Lizars proposed and practiced ligation of the carotid artery, as a preliminary proceeding; this plan is, however, abandoned at the present day, both as unnecessary, and as, in itself, seriously complicating the patient's condition. The tendency of modern surgical writers, indeed, is to speak very lightly of the risk of hemorrhage in excision of the upper jaw, and Prof. Gross, in alluding to this subject, goes so far as to say

that "no skillful surgeon now even employs compression of the carotid artery in these operations," and that "there are no structures in the body of the same extent, in their natural and diseased condition, the removal of which is attended with so little hemorrhage." "With due diffidence," says Ashurst, "I must express my dissent from this opinion. I believe that profuse bleeding is a more frequent cause, if not of death, at least of danger, in excision of the upper jaw, than is commonly acknowledged, and should consider compression of one or even both carotids, during the operation, a highly proper and judicious precaution." Another plan, which is suggested by Fergusson, might also be adopted with advantage; this is to notch, if not fairly divide, the ascending process of the superior maxilla, with the alveolus and hard palate, before dissecting up the cheek or even cutting into the cheek at all—the most tedious part of the operation being thus accomplished, before any incision is made into the most vascular parts. Ligation of the carotid may occasionally be rendered necessary by the occurrence of secondary hemorrhage.

3. The risk of *suffocation from blood flowing into the air-passages*, during the operation, is of course greater when the patient is in a state of anæsthesia, than it would be if chloroform were not employed; and in Mr. Hewett's well-known case,* the fatal result was attributed to this cause. To prevent such an occurrence, anæsthesia should not be pushed further than absolutely necessary, and assistants should constantly mop out the mouth with sponges attached to sticks of a suitable length. Nussbaum, a German surgeon, believing that this is the principal source of risk in jaw operations, advises the preliminary performance of a temporary tracheotomy, the glottis to be closed with a piece of oiled lint, and chloroform to be administered through a tracheal tube; such a plan would, however, I should fear, rather increase than lessen the risks of the operation.

Excision of the greater part of both Upper Jaws was performed by Rogers, of New York, in 1824, and *complete extirpation* has since been practiced by Heyfelder, Maisonneuve, and others; the whole number of operations on record, is about a

* Med.-Chir. Trans., vol. xxxiv, p. 43.

dozen. The incisions for this operation, which is one of the gravest character, consist of a median division of the upper lip, with separation of both nostrils—a duplication, in fact, of the operation recommended for excision of either jaw separately.

In all operations upon the upper jaw, the skin covering the tumor should be scrupulously preserved, no matter how thin and distended it may appear. To complete the subject of excision of the upper jaw, the following *statistics* of the operation are quoted from Heyfelder.

Nature of operation.	Whole No. of cases.	Cured.	Relapsed or died.	Result unknown.
Complete excision of one jaw...	141	51	33	57
Partial " " ...	153	48	35	70
Complete excision of both jaws.	11	5	6	..
Partial " "	8	7	1	..

Tumors of the Lower Jaw.—*Cystic*, *Fibrous*, *Fibro-cellular*, *Cartilaginous*, *Bony*, *Myeloid*, and *Encephaloid* growths are met with in this situation, commonly originating in the cancellous structure in the center of the bone, and projecting both into the mouth, and downward into the side of the neck, in the form of rounded or irregularly lobed masses. The remarks which were made as to the importance of a correct *diagnosis*, in cases of tumor of the upper jaw, are equally applicable with regard to those of the inferior maxilla—simple cystic growths being usually readily curable by laying open the cyst and stuffing its cavity with lint—non-malignant, solid tumors requiring excision with saw and cutting pliers—and cancers of this part, on the other hand, often not admitting of any operative interference whatever.

Excision of the Lower Jaw.—It is occasionally possible, as recently advised by Heath, and as long ago done by the late J. Rhea Barton, of this city, to remove non-malignant solid tumors of the lower jaw, without sacrificing the whole thickness of the bone; and it is certainly desirable, under such circumstances, to preserve the base of the jaw, for the reasons already given in speaking of necrosis of this part. If, however, the whole thickness of the bone on one side be involved, excision may be performed by making a single incision along the base of the jaw,

prolonging the cut, if necessary, in a line corresponding to the position of the ascending ramus, and curving the anterior extremity of the wound upward, toward but not through the prolabium. If the portion of bone to be removed extend beyond the median line, a ligature should be passed through the tip of the tongue, to prevent its retraction when the muscles of the floor of the mouth are divided. In this first incision the facial artery will be cut, and should be immediately secured with ligatures. The flap, formed as above directed, should be carefully dissected up, and the inner side of the jaw cautiously cleared by separating the soft tissues of the mouth—a tooth having been previously extracted on either side of the tumor; the saw is to be applied so as to cut a deep notch through the alveolus, the bone section being subsequently completed either with the saw or cutting pliers. The part to be removed is then seized with the lion-jawed forceps, and wrenched out, any remaining attachments being severed with a few strokes of the knife.

If the morbid growth involve the angle of the jaw and part of the ascending ramus, it will be necessary to disarticulate the bone upon that side; in this case, the incision should be prolonged to the back of the articulation, when the bone, having been divided in front of the tumor, is to be cleared by careful dissection, the surgeon then depressing the body of the jaw, so as to render tense and facilitate the division of the attachment of the temporal muscle to the coronoid process; the jaw being twisted somewhat outward, the joint may now be opened from the front, and disarticulation completed. The edge of the knife should, throughout, be kept close to the bone, lest the internal maxillary or even the external carotid artery should be accidentally wounded. Hemorrhage being checked by ligatures, or, if from the dental artery in the cut surface of bone, by the application of Monsel's salt or the actual cautery, the external incision may be closed by means of the interrupted or twisted suture. Until union is completed, the patient's diet should be limited to liquid food, which may be given through a tube.

Metallic caps, to fit the teeth of the remaining portions of the jaw, and connected with a spring to a similar contrivance applied to the teeth of the upper jaw, are sometimes employed to pre-

vent distortion from the action of the muscles. Such an apparatus is, however, according to Heath, quite unnecessary, as the bone quickly resumes, unaided, its normal position.

If the tumor be very large, involving both sides of the jaw, a U-shaped incision dividing both facial arteries may be employed, as recommended by Fergusson; or, as advised by Heath, the lower lip may be divided in the median line, and the flaps dissected back on either side.

Excision of a part of the lower jaw for tumor, which was first performed by Deaderick, of Tennessee, in 1810 (though his case was not published until thirteen years later), has been practiced a great many times; and, except in cases of malignant disease, with very good results. The proportion of failures under the latter circumstances (twenty-one out of thirty-nine cases, according to Heyfelder), authorizes the question whether in a case of cancer of this part admitting of any operation, complete extirpation would not be better than any less sweeping measure.

Removal of nearly two-thirds of the Lower Jaw, for Osteo-Sarcoma, by the Author.—The subject of this operation, Miss T——, aged nineteen years, from the southern portion of this State, was admitted into the Good Samaritan Hospital the latter part of March of the present year, with a tumor of the lower jaw, as represented by Fig. 370.

The disease commenced about six years ago with slight pain in the lower jaw, which was supposed to proceed from a decayed tooth.

After a while a small circumscribed tumor, about the size of a hazel nut, and just below the second molar on the right side, became cognizable to the touch.

The teeth on either side of the tumor were sound, as were all the remaining teeth in the low jaw. This swelling continued about the same size for one year, attended with little or no pain, after which it slowly increased in bulk, until within the last year, during which time its growth has been very rapid, spreading along its anterior surface and involving the whole of the right side of the jaw. About five months ago it extended beyond the symphisis menti, and encroaching upon the left side as far as the first molar, when its growth became more rapid outwardly, involving the soft structures.

She was seen by two or three medical men residing near her native place; but with the exception of external applications, nothing was done toward a permanent cure.

At the time the patient placed herself under my charge, the tumor had encroached so much upon the buccal cavity as to seriously interfere with deglutition; articulation and mastication were also performed with great difficulty.

On admission into hospital, she had emaciated to a considerable degree, and her strength was rapidly failing. Her mouth and lower part of the face being occupied by a large tumor, extending from the malar bone, to within two or three inches of the base of the neck. Upon opening the mouth, an apparently cartilaginous mass was seen, almost completely filling up the cavity and pushing the tongue over to the opposite *side*, so that in protruding it, its edges were parallel with the mesial line of the body.

In the center of the mass, two teeth could be plainly seen lying over upon the left side of the buccal cavity. The accompanying illustration, taken from a photograph, gives the appearance of the patient with her mouth closed. See Fig. 370.

Fig. 370.

The right body of the lower jaw could not be defined, though the superior portion of the angle could be felt, the articula-

tion not being involved. The tumor, though overlying the upper part of the neck, did not involve its tissues, and the submaxillary and mental glands did not participate in the disease.

On the left side, the angle and ramus of the jaw were clearly defined; the disease stopping short of the first molar tooth of the left side.

The patient being seated in an operating chair, chloric ether was administered which was continued cautiously until complete anæsthesia was produced. Standing in front and upon the right side, I made an incision corresponding with the dotted line in the figure; beginning at the superior part of the mass (A) and terminating by a circular sweep of the knife at the angle of the lips on the left side (B). The flaps were dissected as quickly as possible; the upper one turned over the face and the lower lying upon the neck. The vessels of the flap were tied after the operation and a gentle and continued pressure upon the carotids of either side was kept up. Having thus exposed the tumor throughout its whole breadth, I next proceeded to divide the bone, which was done by a chain saw, at a point on the left side corresponding with the first bicuspid tooth. At this juncture, as had been prearranged, the tip of the tongue was transfixed with a stout needle and ligature, and held during the operation. Then grasping the tumor at the point sawed through, I began to dissect away the mass and divide the muscles and attachments close to the tumor; the vessels having been promptly secured. Then carrying the tumor to the right and outward and dissecting away all its attachments, to near the coronoid process, which was found perfectly healthy, I divided the ramus of the jaw just below the sigmoid notch with the chain saw, and completed the removal of the mass, by a little dissection round its posterior margin.

With a strong bone forceps I cut away all portions of the left jaw that were involved in the disease, and a clean healthy surface remained.

The gap left was of huge size; the fauces, tongue and front of the larynx being fully exposed, and the flap pendulous and superabundant. The incision was then brought together with four interrupted sutures, placed some distance apart to favor the escape of the discharges during the healing of the wound. Ad-

hesive straps were then applied between the sutures; the ligature holding the tongue being secured so as to bring its apex close to the lip.

Lint saturated with *Staphysagria* lotion was placed in the large cavity and also applied to the external wound, and a bandage employed to maintain the shape of the face and prevent oozing. The patient was then placed in bed and a few doses of *Arnica* given to counteract the shock of the operation, and to bring about reaction.

The quantity of blood lost did not exceed six ounces, though the tumor weighed nearly two pounds. Reaction followed in a few hours and the patient passed a comfortable night.

On the following day, injections of beef tea were thrown up the rectum, and the patient was otherwise sustained by nourishing drinks of animal broths and milk.

May 3d.—A little fever was observed which readily yielded to a few doses of *Aconite*. The old dressings were removed and fresh ones applied.

May 4th.—Union having taken place throughout nearly the whole extent of the wound, the sutures were removed and fresh lint, saturated as before, with adhesive straps freshly applied as before, and the mouth well washed out with a lotion of *Staphysagria*.

May 5th.—The ligature holding the tongue was removed; the patient swallowing without much difficulty. The quantity of nourishment was increased.

May 6th.—Suppuration began, for which *Calendula* was given.

May 7th.—Continued treatment as before.

May 8th.—The wound was entirely healed, appetite good; the patient was able to swallow solid nourishment, and all evidences of treuble had passed away.

The patient continued to improve, the dressings having been freshly applied every day until the 16th of May, when my services in this case were no longer required. About the first of June, the patient left hospital, perfectly cured.

The success of this operation, I believe to be largely due to the after-treatment, and in this connection I cannot but testify

my approbation of the brilliant success following the use of *Staphysagria* and *Calendula* lotions, and the internal use of *Arnica* and *Aconite* to overcome the shock and fever attending operations of this magnitude, as well as to moderate reaction.

Anchylosis or Closure of the Jaws may follow sloughing resulting from the abuse of mercury or from cancrum oris, or occurring in the course of low fevers; it may also be caused by rheumatoid arthritis, by the contraction of the cicatrix of a burn, or by a wound of the temporo-maxillary articulation. If the anchylosis be confined to *one side*, it may be remedied by a resort to Rizzoli's or Esmarch's operation, the latter procedure being probably the better of the two. Rizzoli's operation consists in simply dividing the jaw with a narrow saw in front of the cicatrix, so that mastication may be accomplished by means of the natural articulation on one side, and the artificial false joint on the other. Esmarch meets the same indication by excising a wedge-shaped portion of bone, three-quarters of an inch wide at its upper part, and an inch below. Dr. Buck, of New York, has recently performed Esmarch's operation (in a case of cicatricial contraction resulting from cancrum oris), but though an inch and a half of bone was removed, the parts became reapproximated, and the operation seems to have been only partially successful: a better plan is, according to Durham, to separate the jaw with a screw-lever, and then endeavor to restore the functions of the part by practicing passive motion. The section of the bone should always be made *in front* of the cicatrix. If *both sides* of the jaw are anchylosed, provided that the whole thickness of the cheek is not involved, an attempt may be made to restore the mobility of the part by dividing the cicatricial bands from within, and gradually separating the jaws by means of a screw dilator, or, which Heath prefers, by the use of metal shields adapted to the teeth, and forced apart with wedges. This mode of treatment, though both tedious and painful, can, according to Heath, be made, with care and attention, to yield very good results.

SECTION IX.

OPERATIONS ON THE NECK.

The operations usually done on the neck, concern its lateral and anterior aspects; those on other portions of it, such as the removal of tumors, are rare, and no rules can be laid down for them. The surgeon has to adapt his knowledge of normal anatomy to the exigencies of each case. Before discussing these I shall, however, first advert to the important subject of asphyxia.

Apnea, or as it is more commonly called, *Asphyxia*, may arise from various causes, such as drowning, inhalation of chloroform or of poisonous gases, spasm or œdema of the larynx, or the presence of false membrane, of a morbid growth, or of a foreign body in any portion of the air-passages. The surgical operations employed in the treatment of apnea, are, *artificial respiration* and the various procedures which are included under the general term of *bronchotomy*. *Bronchotomy* is applicable to cases in which the air-passages themselves are in any way obstructed; *Artificial Respiration* to cases in which the air-passages are free, or in which apnea continues after the performance of bronchotomy.

Artificial Respiration.—This may be effected in several ways:

1. *Mouth to Mouth Inflation,* though objectionable as furnishing air which has already been expired, is occasionally the only method which can be employed in an emergency, and may be resorted to, in any case, while more efficient means are being procured.

2. *Inflation with Bellows*, provided with a suitable mouth or nose piece, may be efficiently used, provided that care is taken to secure expiration by manual compression, and that the instrument is worked gently, and not more than ten or twelve times in the minute.

3. *Inflation with Oxygen Gas* might be tried in extreme cases, or when other means had failed; the gas might conveniently be administered from a bladder, fitted with a mouth-piece.

4. Artificial respiration may readily be practiced by alternately *Compressing the Chest and Abdomen* with the hands, to

imitate expiration, and then allowing the natural resiliency of the thoracic walls to produce expansion, and thus imitate inspiration. This method is very easily applied, and is particularly suitable in cases of apparent death from chloroform.

5. *Silvester's Method*, which is that adopted by the Royal Humane Society, of England, consists in placing the patient in a supine position, with the head and shoulders slightly elevated, then grasping the arms above the elbows, drawing them gently but steadily upward until they meet above the head, keeping them thus for two seconds, and, finally, bringing them downward, and pressing them for two seconds more against the sides of the chest. This manipulation is to be repeated, fifteen times in the minute, until natural respiration is established, or until a sufficient time has elapsed to show that further efforts are useless.

6. *Marshall Hall's "Ready Method."*—This mode of treatment, under the name of "Prone and Postural Respiration," is thus described by its distinguished author:

"Treat the patient instantly, on the spot, in the open air, exposing the face and chest to the breeze (except in severe weather.)

1. *To Clear the Throat.*—Place the patient gently on the face, with one wrist under the forehead. (All fluids, and the tongue itself, then fall forward, leaving the entrance into the wind-pipe *free.*) If there be breathing, wait and watch; if not, or if it fail—

2. *To Excite Respiration.*—Turn the patient well and *instantly* on his side, and excite the nostrils with snuff, the throat with a feather, etc., and dash cold water on the face previously rubbed warm. If there be no success, lose not a moment, but instantly—

3. *To Imitate Respiration.*—Replace the patient on his face, raising and supporting the chest and abdomen well on a folded coat or other article of dress.

Turn the body very gently on the side and a little beyond, and then briskly on the face, alternately; repeating these measures deliberately, efficiently, and perseveringly fifteen times in the minute, occasionally varying the side. (When the patient reposes on the chest, this cavity is compressed by the weight of the body, and expiration takes place; when he is turned on the side, this pressure is removed, and inspiration occurs.)

When the *prone* position is resumed, make equable but efficient *pressure*, with brisk movement, along the back of the chest, removing it immediately before rotation on the side. (The first measure augments the expiration, the second commences inspiration.) The result is respiration; and, if not too late, life!

4. *To Induce Circulation and Warmth.*—Rub the limbs *upward*, with firm grasping pressure and with energy, using handkerchiefs, etc. (By this measure the blood is propelled along the veins toward the heart.)

Let the limbs be thus dried and warmed, and then clothed, the bystanders supplying coats, etc.

Avoid the continuous warm bath, and the position on or inclined to the back.

Whatever mode of treatment be adopted, should be perseveringly continued for three or four hours, unless sooner successful; if *secondary apnea* come on after apparent recovery, artificial respiration should be again resorted to, together with the application of electricity to the base of the brain and upper part of the spinal cord.

Bronchotomy.—Under this name are embraced the operations of *Laryngotomy* and *Tracheotomy*, together with their modifications, *Thyrotomy*, *Crico-thyrotomy*, and *Laryngo-tracheotomy*, the names of which sufficiently express their nature.

Laryngotomy.—In this operation the windpipe is opened through the crico-thyroid membrane. The larynx being steadied between the thumb and fingers of the left hand, the surgeon makes a vertical incision about an inch long, in the median line, over the lower half of the thyroid cartilage, the crico-thyroid space, and the cricoid cartilage. The sterno-hyoid muscles being now separated, and the intervening fascia and connective tissue divided, to the full extent of the cutaneous wound, the knife is at once thrust, with its edge upward, through the crico-thyroid membrane and its mucous lining, into the larynx. The opening is then enlarged transversely as much as may be required, and the tube introduced. The only vessel likely to be cut is the crico-thyroid artery, which should, as a rule, be secured before opening the larynx. This operation, which is by no means difficult, may be performed either with, or without the aid of anæsthesia, the

patient being in a recumbent position, with the head thrown backward, and the neck rendered prominent as is seen in Fig. 371.

Tracheotomy.—In this operation two or more of the tracheal rings are divided, or an elliptical portion of their anterior face cut away. The instruments required are: a scalpel, forceps (artery, dissecting and bull-dog), double-hook scissors, two tenacula, two blunt hooks, ligatures, sponges, long curved forceps for extracting foreign bodies, and a double tracheal tube. The

Fig. 371.

Operation of tracheotomy.

patient being in the position already described, and preferably under the influence of an anæsthetic, the surgeon makes a vertical incision, from the bottom of the cricoid cartilage downward, for an inch and a half or more, according to the length of the neck. The subcutaneous fat and areolar tissue are similarly divided, care being taken to avoid any superficial veins; the sterno-hyoid and sterno-thyroid muscles being then cautiously separated with the handle of the knife, or with the director, the trachea, crossed by the isthmus of the thyroid gland, is exposed. The trachea may be opened above, through, or below the thyroid isthmus, the first being, in the case of children especially, the point to be preferred; if it be necessary to cut through the isthmus, a ligature must be first applied on either side of the point of division. Hemorrhage having been arrested, the surgeon

draws forward the trachea with a single or double tenaculum, and thrusting in his knife, edge upward, divides the necessary number of rings. The tube is then at once introduced, and when the respiration has become tranquil, the surgeon may temporarily remove it, and proceed to cut away an elliptical portion of the front wall of the trachea; this step, though condemned by high authority, is not in itself objectionable, and is in many cases of positive advantage.

The above description presupposes that the surgeon has time to make a careful dissection of the superincumbent parts, before opening the windpipe—and, in the immense majority of instances, enough time is afforded for this purpose. Cases, however, are occasionally met with, in which it is very important to hasten the steps of the operation; and, in such emergency, I recommend a plan described by Mr. Durham, and which he assures us he has advantageously employed in nineteen instances. In this method the operator (standing on the patient's right side) places the forefinger of the left hand on the left side of the trachea, and the thumb on the right, pressing steadily backward until he feels the pulsation of both carotid arteries. By slightly approximating the finger and thumb, he feels that the trachea is firmly and securely held between them, and knows that the safety of the great vessels is insured, while the tissues over the windpipe are rendered tense. The finger and thumb thus placed are not to be moved until the trachea is reached. By a succession of careful incisions the surgeon now cuts boldly down on the windpipe, the finger and thumb on either side helping him to judge of the position of the median line (from which the knife must not deviate), and, by their pressure, causing the wound to gape, and the trachea to advance. The forefinger of the *right* hand is passed from time to time into the wound, to make sure that no important vessel is in the way, and when the trachea is reached the knife is introduced (guarded by the right forefinger), or the windpipe may be seized with a tenaculum and opened as in the ordinary operation.

The chief *danger* from tracheotomy is from *hemorrhage;* instances are on record in which the carotid, or even the innominate artery has been wounded, while fatal bleeding has not unfre-

quently occurred from the division of large veins. *Arterial* hemorrhage should, of course, be checked before opening the trachea, and bleeding *veins* should also be secured, provided death from suffocation is not likely to occur while this is being done. It must be remembered, however, that the venous congestion is due, in great measure, to the obstruction of the patient's breathing, and will be lessened as soon as free respiration is established; hence the surgeon should not fear, if necessary, to open the windpipe even while venous bleeding continues, introducing the canula, as has been forcibly said, "even through a very pool of blood."

Laryngo-tracheotomy is, as its name implies, a combination of laryngotomy, with tracheotomy above the thyroid axis. Its mode of performance requires no special description.

After-treatment of Cases of Bronchotomy.—In almost all cases, except those of foreign body in the air passages, it is necessary to introduce a *tracheal canula* or *tube*, which must be worn until the power of breathing through the larynx is restored. The tube should be made of silver, with a curve of rather less than a quarter of a circle, *double*, so that the inner canula may be removed and cleansed, while the outer retains its position, the two being secured by means of a button attached to the neck-plate of the outer one. Fig. 372. The neck-plate itself should be so arranged as to allow the canula to move freely with the motions of the trachea, and the inner tube should project beyond the outer one for about a quarter of an inch at either extremity. The length of the canula should be from two to three inches, and its calibre from one-fourth to three-eighths of an inch, according to the age of the patient. For use after *laryngotomy* the canula may be a little flattened, the transverse being somewhat greater than the antero-posterior diameter of its section.

Fig. 372.

Tracheal tube.

The canula above described, which embraces the improvements of both Obre and Roger, is, I think, preferable to either the ordi-

nary double tube, or the bivalve canula of Fuller. Mr. Durham has suggested a still further modification, by which the length of the tube can be regulated by means of a screw, to meet the emergencies of any particular case. To facilitate the introduction of the tube, the edges of the wound may be held apart with two or three-bladed dilating forceps, or, which is probably better, a blunt-pointed pilot trocar, as suggested by Dr. Gairdner, may be thrust in with the canula, to be withdrawn, of course, as soon as the latter is in place.

The canula being introduced, is held in position by tapes, attached to the neck-plate, and fastened around the neck. During the whole course of after-treatment, the atmosphere of the room should be kept moist, and rather warm; the inner tube should be frequently removed and cleansed, and if the operation have been done for pseudo-membranous croup or diphtheria, lime-water or dilute carbolic acid should, from time to time, be vaporized through the tube with an atomizer. As soon as the canula can be safely dispensed with, it may be removed, but this should not be done until, by keeping it plugged for several hours at a time, it has been proved that the function of the larynx has been restored.

If it be necessary to perform bronchotomy in an emergency, and when a tracheal canula cannot be obtained, the surgeon must have recourse to excising an elliptical portion of the tracheal wall, and keeping the edges of the wound apart with retractors made of bent wire (hooks of ordinary large "hooks and eyes" will answer), secured by an elastic band passing behind the neck. If apnea persist after a free opening has been made into the windpipe, the surgeon must at once resort to one or other of the methods of practicing artificial respiration already described.

Choice of Operation.—The relative advantages of *laryngotomy* and *tracheotomy* are still a matter of dispute among practical surgeons. Tracheotomy is preferred in all cases by Mr. Marsh, and laryngotomy, or laryngo-tracheotomy, by Mr. Holmes, especially among children. Mr. Erichsen recommends laryngotomy for adults, and tracheotomy, above the thyroid isthmus, for children; while Mr. Durham considers that the advantages of opening the trachea below the isthmus, as compared with its risks and difficulties, are greater than those afforded by

making the opening higher up. While I do not believe that any rule of universal application can be safely laid down upon this question, I would advise, in general terms, that *tracheotomy above the isthmus* should be preferred, in all cases in which time is afforded for a careful and deliberate operation, but that if great haste be essential, *laryngotomy*, which may readily be converted subsequently into *laryngo-tracheotomy*, should be performed instead. When the operation is required by the presence of a foreign body in the windpipe, a more definite rule may be given. If the offending substance be lodged in the larynx, that part itself must be opened; but if the foreign body be in any other part of the air passages, tracheotomy is the operation to be chosen.

§ 1.—INJURIES OF THE ŒSOPHAGUS.

Wounds.—These have already been alluded to in describing penetrating wounds of the neck, the treatment of which injuries is complicated by the œsophageal wound, through the difficulty thence arising in administering the necessary amount of nutriment. A patient with wound of the gullet, may be fed through an elastic gum catheter, introduced through the mouth, or, if, with suicidal intent, he refuse to separate the jaws, through the nose. By this means a pint of beef-essence, or of "egg-nogg," may be introduced two or three times a day, until the power of deglutition returns. If the wound is above the position of the larynx, suffocation may occur from the supervention of œdema of the glottis—an accident which would call for the immediate performance of laryngotomy.

Foreign Bodies in the Pharynx or Œsophagus.—Foreign bodies not unfrequently become impacted in some portion of the food-passage, and produce not only great irritation and difficulty of swallowing, but may even induce suffocation by pressure on the windpipe. The symptoms vary with the nature, size, and position of the foreign body. A fish-bone, bristle, or pin may be caught between the tonsil and half-arches of the palate, and give rise to much discomfort, with tickling cough, dysphagia, and nausea. A pointed body in this situation may even perforate an important vessel, and thus cause death by hemorrhage. A bolus of food, arrested at the summit of the œsophagus, may suffocate the patient by pressure on the larynx; or, again, a hard body,

such as a bone or tooth-plate, may, if impacted, produce ulceration of the œsophageal walls, and penetrate into the larynx, or other important structures in the neighborhood.

It is possible that the presence of the material in the throat may elude detection even after careful and repeated exploration; on the other hand, the sensations of the patient may continue to indicate the impaction of a foreign body for a long period, when none is really present, and œsophagotomy has actually been performed, on more than one occasion, without any substance being found which could account for the patient's symptoms. Under such circumstances it is proper to examine the throat by the sweep of the finger internally, or by aid of the laryngoscope.

Treatment.—If suffocation be threatened, unless the foreign body can at once be seized and removed, tracheotomy should be resorted to without delay. In every case an effort should be made to extract the foreign body through the mouth, and this can usually be done, either by simply hooking it out with the finger (if lodged in the pharynx), or by the cautious use of œsophageal forceps, or of the horsehair or swivel probang. If the foreign body be of such a nature that it will not be likely to produce injurious consequences in the stomach and bowels, as a lump of meat or even a small coin, it may, if its extraction prove difficult, be pushed onward into the stomach, with a sponge or ivory-headed probang. If, as occasionally though rarely happens, a foreign body in the gullet can be neither extracted, nor otherwise disposed of, it should be removed through an external incision, by the operation known as *pharyngotomy* or *œsophagotomy*.

Œsophagotomy—If the foreign body can be felt externally, the operation should be done on that side which is the most prominent; otherwise the left side is to be chosen, as the œsophagus naturally inclines somewhat in that direction. The patient should be anæsthetized, and placed in a supine position, with the head and shoulders a little raised, and the face somewhat averted. An incision, four or five inches long, is made in the space between the trachea and the sterno-mastoid muscle, beginning above, on a level with the top of the thyroid cartilage. This incision is cautiously deepened, the omo-hyoid muscle, and the outer fibres of the sterno-hyoid and sterno-thyroid, being divided if necessary; the carotid sheath is carefully drawn outward, and

held with a blunt hook, the trachea and thyroid gland being similarly drawn inward. If the foreign body can now be felt, the œsophagus may be incised directly upon it; otherwise a sound or curved forceps should be introduced through the mouth, and made to project in the wound, thus affording a guide to the point at which the gullet should be opened. The incision may be subsequently enlarged, either upward or downward, and the foreign body extracted with the finger or forceps.

Special care must be taken, in this operation, not to wound either the inferior thyroid artery, or the recurrent laryngeal nerve. The incision should be allowed to heal by granulation, the patient being fed through a catheter, as after an accidental wound of the œsophagus. This operation is essentially that which has been successfully performed by Syme, Cock, and Cheever, and seems to me in every way preferable to that by a median incision, which is recommended by Nelaton. The *results* of œsophagotomy for the removal of foreign bodies are quite encouraging, there being, according to Cheever's statistics, about twenty cases on record, in which the offending object was removed, with only four deaths, none of which was justly attributable to the treatment employed. As further evidence of the innocuousness of the operation, it may be mentioned that in three other cases, in which no foreign body was found, the patients likewise recovered.

Introduction of the Stomach Tube.—This may be required in cases of narcotic poisoning, in which vomiting cannot be excited, or as a means of administering fluid nutriment, in cases in which the patient cannot or will not swallow. The tube is introduced in the same manner as an œsophageal bougie, and the following description will apply to the use of either instrument. The patient is placed in a sitting posture with the head thrown backward, so as to bring the mouth and gullet as nearly as possible into the same line; the mouth being held widely open (by means of a gag if necessary), the surgeon passes the tube, previously warmed and oiled, directly backward to the pharynx without touching the tongue, and guiding the instrument over the epiglottis with the forefinger of the left hand, cautiously presses it onward into the stomach. If any obstruction be met with, the instrument should be slightly withdrawn and then again pushed forward, very gently, however, lest the œsophageal wall should be perfo-

rated. When food is to be introduced into the stomach, the surgeon may employ a small gum-elastic bag, provided with a nozzle which closely fits the projecting portion of the tube; when it is designed to wash out the stomach, a pump is required, by which one or two pints of tepid water may be injected and a less quantity immediately pumped out again, the process being repeated until the returning fluid is colorless: the object of not completely emptying the stomach at once, is to prevent the mucous coating of the organ from being sucked into the orifice of the tube and thus lacerated.

The risk of passing a stomach pump into the *trachea* instead of the *œsophagus* is not entirely imaginary, as is shown by cases in which after death, food and medicines have actually been discovered in the lungs.

Tumors, Warts, or Polypi of the larynx are sometimes met with, belonging usually to the fibro-cellular, papillary, or epitheliomatous varieties of tumor. They produce hoarseness, aphonia, croupy cough, and dyspnœa, the difficulty of breathing recurring paroxysmally, and eventually causing death by suffocation. A flapping sound may often be heard as the tumor moves up and down in the act of breathing, and, by the use of the laryngoscope, the size and position of the morbid growth may be sometimes accurately determined.

Operation.—In any case in which respiration is or has been at any previous time seriously embarrassed, there should be no delay in opening the trachea and inserting a tube; for experience shows that fatal dyspnœa may in such a case supervene at any moment, and, besides, a preliminary tracheotomy will greatly facilitate any operation for the removal of the tumor. Various plans may be adopted in dealing with the new growth itself: thus an attempt may be made to extract it by means of a *wire snare* or *ecraseur*, as has been successfully done by Walker, Gibb, Johnson, and others; or delicate *laryngeal forceps*, as advised by Mackenzie, may be used to twist off or crush the tumor; or, if too firmly attached, this may be cautiously excised with the *knife*, *scissors*, or "*laryngeal guillotine*," or may be severed by the application of the *galvanic cautery*; simple *puncture* may suffice in the case of a cystic growth, while in other instances a cure may perhaps be effected by the repeated appli-

cation of *nitrate of silver* in substance or solution. The latter mode of treatment may also be employed to prevent repullulation of the tumor after extirpation. In all of these methods, the application of the instrument should be guided by the use of the *larnygoscope*. Another plan is to open the crico-thyroid membrane and divide the thyroid cartilage, so as to expose the interior of the larynx and allow free excision of the morbid growth with knife or scissors; this operation appears to have been first successfully performed by Ehrman, of Strasburg, and has since been repeated by Holthouse, Holmes and Durham, of London, Buck and Sands, of New York, Cohen, of Philadelphia, and others. Krishaber, of Paris, has recently recommended, under the name of *Restricted Thyroideal Laryngotomy*, an operation in which the thyroid cartilage alone is divided in the median line, this incision being in his opinion ample for the removal of polypi situated in the ventricle of Morgagni; the vocal cords are not interfered with, and the voice is consequently uninjured by the operation, which is in this respect decidedly preferable to that of Ehrman.

Dr. Sands has tabulated fifty cases of laryngeal tumor treated by operation; in eleven the growth was removed by external incision, and in nine of these the patients recovered; in thirty-nine cases the tumor was removed by the mouth, and recovery followed in thirty-eight. The operation was performed with the aid of the laryngoscope in thirty-four cases. Still more extended statistics have been published by Mackenzie and Durham, those of the former author showing conclusively that, when applicable, *laryngoscopic treatment* is much preferable to the operation by external incision. The following table is condensed from Durham's, in *Holmes's System of Surgery:*

Operation.	Whole No. of Cases.	Completely successful.	Partially successful.	Died.
Application of Caustics, etc...	16	12	4	..
Forceps	37	33	3	1
Wire snare.....	32	28	3	1
Galvanic cautery.....	5	3	2	..
Excision.....	20	14	5	1
Puncture.....	4	4	..	..
Operation by external section	24	15	5	4
Total.....	133	109	22	7

CHAPTER III.

OPERATIONS ON THE THORAX.

SECTION I.

AMPUTATION OF THE BREAST.

With a few rare exceptions, it is in females that this operation is necessary. We are not here concerned with the subject of the diagnosis of the tumors for which it is done, nor with the equally important question as to the amount of benefit conferred by it; but may remark that once decided upon, it should not be needlessly delayed.

The variety of tumors that invade this organ, and their characteristics, are fully pointed out in vol. 1, page 563, to which the reader is referred. The female breast is very frequently the seat of tumors, the chief forms of morbid growth of a non-malignant character met with in this situation being the cystic and the glandular, though fibrous, fibro-plastic, cartilaginous and osseous tumors are occasionally found in the breast, as are also true hydatids, scrofulous and tuberculous deposits. Of the *malignant* growths, schirrus is by far the most frequent, encephaloid coming next, and colloid and melanoid cancer being comparatively rare.

Operation.—The patient should be etherized, lying on a firm bed or table, with the diseased part in a good light, and the arm raised to at least a right angle with the body. The assistant who gives the anæsthetic can generally support the arm in this way, with one hand at the bend of the elbow.

The steps of the operation are: incision of the skin and subcutaneous tissue; the enucleation of the entire gland and any diseased structures in its neighborhood; the arrest of bleeding; and the closure of the wound.

The instruments needful are: two or three scalpels; dissecting-forceps; artery-forceps and tenaculum; vulsellum forceps;

scissors; two blunt hooks or spatulæ; ligatures; suture-needles and sutures.

The operator, standing or sitting at the side of the patient, makes the lower incision first, and then the upper; taking care to leave enough skin to come together well after the removal is completed. Figure 373. (Operations sometimes succeed well even when the edges cannot be approximated, the wounds healing by granulation; but this should if possible be avoided.) Any vessels which spring may either be tied at once, or temporarily secured with catch-forceps, to be subsequently attended to.

Fig. 373.

By means of the knife-handle, delicate touches of its edge, and his fingers, the surgeon next separates all the areolar tissue connecting the tumor with the surrounding parts, drawing it out with his left hand, or by means of the vulsellum forceps. With the fingers as well as the eye, he now carefully explores the wound, to ascerain that all the disease is removed. Should the axillary glands be enlarged, it is better to take them away, even if the wound has to be extended for the purpose.

All the divided vessels should next be secured, either by acupressure or by ligation; the edges of the wound brought together with sutures and adhesive strips, or with adhesive strips alone, and the dressings applied. My plan is to apply dressings saturated with *Staphysagria* lotion during the first day or two for the purpose of promoting union by first intention, failing in this, the *Calendula* dressing is the most serviceable. Finally, the arm should be lightly confined in an easy posture.

SECTION II.

PARACENTESIS THORACIS, OR TAPPING OF THE PLEURAL CAVITY.

This operation is done for the evacuation of pus or puruloid fluids, or sometimes of serum, as the result of chronic pleurisy. It is very simple, and is generally rendered easy by the bulging of the intercostal spaces. The point to be selected is between the eighth and ninth ribs, a little in front of the angle of the scapula.

Operation.—The patient is placed in a sitting posture, well supported, leaning backward, and turned somewhat away from the surgeon; who either plunges at once a trocar and canula through the skin and deeper tissues into the pleural cavity, or makes a preliminary incision an inch or less in length. The point of the trocar is in either case entered at a right angle to the chest-wall, and then elevated by depressing the handle, so as to avoid any chance of wounding the pulmonary pleura.

Sometimes a syringe, having a pipe fitting accurately to the canula, is used to draw off the liquid. This pipe has a stop-cock, and at right angles to it another pipe, also furnished with a stop-cock; the first is opened and the second closed, while the syringe is being filled, an assistant holding it perfectly steady by means of a cross-bar. Now, the first stop-cock being closed and the second opened, the liquid is discharged into a basin or other receptacle. This process may be repeated until the pleura is as nearly emptied as is deemed necessary; but under no circumstances should air be allowed to enter the cavity.

Pneumothorax signifies a distension of the cavity of the pleura with air, and collapse of the lung. It is known by the following symptoms: On the affected side there is an absence of the respiratory murmur, with an exceedingly clear sound on percussion, and immobility of the ribs; and there is *puerile respiration* on the other side. It may be caused, 1, by a fractured rib which has lacerated the lung—and in this case it is attended with emphysema. 2. It may be caused by the bursting of an abscess of the lung into the cavity of the pleura. This case will be indicated by *succussion* and by *metallic tinkling*, in addition to the signs mentioned above. *Succussion* simply con-

sists in shaking the patient, when (inasmuch as both air and fluid have escaped from the lung into the pleural cavity) the fluid will be heard to splash, if the ear is applied to the chest at the level of the fluid. If there is fluid in the cavity of the pleura and air besides, the clearest parts on percussion will always be uppermost, in whatever posture the patient may be. The *metallic tinkling* is a clear sound, like the dropping of water into a cask. It is produced when the patient coughs, by which means a drop of fluid is shaken from the orifice in the lung, and made to fall to the bottom of the chest. 3. It may be a consequence of the escape of air from a wounded lung, after the external wound through the parietes of the chest has been closed.

Operation.—So far as the mere surgical treatment of this symptom is concerned, if the breathing become very difficult, with a distended and tympanitic condition of the diseased or injured side of the chest, a small trocar may be introduced between the fifth and sixth ribs, to let the air escape.

Hæmothorax, which signifies the presence of blood in the pleural cavity, may be suspected if great dyspnœa and dullness on percussion follow a fractured rib, or if it come on rapidly after closure of a wound in the chest. The blood may proceed either from the intercostal artery, or from the lung.

Operation.—If the difficulty of breathing be very urgent, an incision must be made to let the blood escape.

Hydrothorax, or water on the chest, is indicated by great difficulty of breathing, especially on lying down—livid countenance—disturbed sleep—dullness on percussion—and if the effusion be confined to one side of the chest there is very great difficulty in lying upon the other.

Operation.—If the hydrothorax were merely an inflammatory effusion from pleurisy, a local affection, *paracentesis* might be advisable for the dyspnœa; but if (as it is generally) it is an effect of organic disease of the heart or lungs, the operation would do no good. At all events, both sides of the chest must not be punctured.

Empyema signifies abscess of the chest, or suppuration of the pleura. It is an effect of acute inflammation, whether idiopathic, or caused by injury; or else of the bursting of abscesses into

the chest, or of the irritation of carious ribs. It is known by dullness on percussion, gradually increasing enlargement of the side of the chest—separation of the ribs—dyspnœa—difficulty of lying on the sound side—more or less œdema of the parieties of the chest—shivering and hectic, and the other signs of deep-seated suppuration. If left to itself, the abscess may point and burst between the ribs.

Operation.—Paracentesis is decidedly required, if the case be clear; if it be not, two or three punctures may be made with a grooved needle, or a small exploring trocar, and a cupping-glass be applied over them to extract some fluid.

Hydrops Pericardii may occur under the same conditions as hydrothorax, and may be combined with it. Its diagnosis is obscure. It may be suspected to exist if the patient complain of constant weight in the præcordia, great dyspnœa, especially when lying on the back, and faintness upon exertion; if there is great dullness on percussion, and manifest fullness over the region of the heart—if its pulsations are tremulous—and the circulation embarrassed. The operation of *paracentesis pericardii* has been practiced, although it can rarely be of much benefit, and ought not to be dreamed of until other treatment had failed entirely. It has been attempted in sundry cases of hydrothorax, which were mistaken for hydrops pericardii; but by a second lucky mistake the pleura was opened instead. It may be performed either by making an incision opposite the heart's apex, and dividing the muscles and pericardium with the same precautions as in paracentesis thoracis, or by first making an opening into the pleura, opposite the junction of the fifth or sixth rib with its cartilage—and then introducing the finger, feeling for the distended pericardium, and cutting into it with curved scissors; but it is an operation by no means recommended.

Wounds and Contusions of the Parietes of the chest require the same treatment, whether the ribs are fractured or not. A bandage may be applied to prevent motion of the ribs, if the patient express himself relieved by it; but sometimes it adds to the distress, and must not be used. The diet should be moderately low, cough and irritation be allayed by appropriate remedies and *Aconite* be employed, if necessary, to moderate inflammation.

Penetrating Wounds of the thorax, such as stabs from a sword, are usually attended with wound of the lung. In the dead body, when air is admitted to the cavity of the pleura, the lung collapses at once: this is certainly not the case in the living body, unless the external wound be very extensive indeed;—on the contrary, the lung continues to discharge its functions, although less perfectly in proportion to the amount of air passing in and out of the wound in the chest. It has been ascertained that the respiratory murmur may be perfect throughout the lung, just after a wound into the pleural cavity has been closed.

Hernia of the Lung.—If the lung protrudes, the rule generally is, to return it as quickly as possible, unless it is injured or beginning to mortify; but Mr. Guthrie recommends that it should be permitted to remain, as it closes the aperture into the pleura, and speedily granulates and heals over. Hernia of the lung, without external wound, protruding through the pleura amongst the muscles, is excessively rare, and must be treated by bandage or truss.

The Mammary Gland in the male may occasionally be the seat of disease; thus it has been found hypertrophied, and has been known to furnish a secretion of milk, while it is sometimes the seat of cystic growths, or of scirrhous or medullary cancer.

The *treatment* would be the same as for similar affections in the female.

SECTION III.

WRY-NECK.

This affection, which is also known as *Torticollis* or *Caput Obstipum*, is occasionally congenital, but more often originates in children from three to ten years old. It consists in a contraction of the cervical muscles, particularly the sterno-cleido-mastoid and trapezius, usually on one side only, but sometimes on both. The head is drawn downward and inclined to the affected side, being at the same time rotated in the opposite direction. In the congenital form of the disease, and in that which is acquired (if long continued), the deformity is increased by

defective development of the corresponding side of the face and head. The cervical vertebræ undergo rotation on their axis, becoming twisted, and serving to maintain the deformity, and ultimately compensatory lateral curvature is developed in the rest of the spinal column.

Wry-neck is more common in girls than in boys; it is apparently due to irritation of the spinal accessory nerve—the *non-congenital* variety coming on after the eruptive fevers, or as the result of glandular inflammation or ordinary muscular rheumatism. It sometimes occurs as a reflex phenomenon, depending on the irritation of teething, or of intestinal parasites. Many of the cases which are considered *congenital* are, according to Little, due to injuries received during birth. When both sterno-cleido-mastoid muscles are involved, the affection will usually be found to have a rheumatic origin.

The *operative treatment* of wry-neck consists in the subcutaneous division of one or both of the lower attachments of the affected sterno-cleido-mastoid muscle; the *sternal* portion may be divided by introducing an ordinary tenotome in front of the upper margin of the sternum, and about half an inch above the line of the clavicle, and, having passed the knife behind the tendon, with its flat surface toward the latter, turning the edge forward, and cutting the muscle, which is previously rendered tense, with a slight sawing motion from behind forward. The *clavicular* attachment may be divided by a similar operation, through a puncture made at its posterior edge; or, which is perhaps safer, a small incision may be made down to the clavicle, between the two portions of the muscle, and the clavicular attachment then cut from behind forward, with a delicate probe-pointed tenotome which is cautiously insinuated between the muscle and the bone. As soon as the tendons have been divided, the punctures should be closed with lint wet with *Ledum* lotion, and an adhesive strip, the patient being then placed in bed with the head well supported; after a few days an apparatus may be applied to effect mechanical extension, while the cure is further promoted by the systematic employment of friction and passive motion. The operation for wry-neck is one of much delicacy, and not free from risk, the principal danger being from the possibility of

wounding the external or internal jugular vein, or the carotid artery; that this risk is not merely imaginary is shown by the fact that, in more than one case, the operation has been followed by fatal hemorrhage.

Various forms of mechanical apparatus are employed in the after-treatment of wry-neck; in young subjects, it may sometimes be sufficient to apply a broad adhesive strip around the forehead and occiput, and another around the waist, fastening the two together by means of a bandage carried from above the ear of the unaffected side across the chest to the opposite side of the trunk, thus reinforcing the healthy sterno-cleido-mastoid muscle, and so causing the disappearance of the wry-neck. A more elegant appliance is that of Jorg, which consists of a leather corset and firm head-band, connected by a steel rod worked by a ratchet-wheel and key. Other efficient forms of apparatus act by means of two levers, one pressing on the side of the chin, and the other on the opposite temple.

CHAPTER IV.

OPERATIONS ON THE ABDOMEN.

SECTION I.

PARACENTESIS ABDOMINIS.

Tapping of the abdomen is not unfrequently necessary for the relief of ascites, or an accumulation of serum in the peritoneal cavity. It is done with a large trocar and canula; the liquid to be drawn off is often too thick to pass readily through a small instrument, and the operation would be unnecessarily tedious.

Operation.—The patient is seated on the edge of a chair or bed; a sheet or wide piece of muslin is torn into strips about three inches wide, from either end, to within two feet of the middle, thus leaving a central portion four feet across, which is

placed in front of the abdomen, and the pairs of ends successively crossed behind the back. Now the trocar is entered either in the median line, below the umbilicus, or at the middle point of a line drawn from the umbilicus to the anterior superior spine of the ilium; a hole being cut in the muslin at whichever point is chosen. The trocar being withdrawn, the liquid flows out through the canula, and the abdominal walls are supported by two assistants drawing on the ends of the bandage behind.

Should the patient become faint, the flow of liquid may be temporarily checked, and a little wine or brandy administered. The bandage is kept applied for a few days.

SECTION II.

ABSCESS OF THE LIVER.

When abscess of the liver is clearly diagnosed, it is of course desirable to evacuate the matter externally. But if a puncture be made, the abdominal wall and the liver being separate, the pus will flow into the cavity of the abdomen, and excite dangerous peritonitis. Hence it has been proposed to apply a cautery to the skin around the proposed point of operation, so as to induce adhesion between the opposed surfaces of peritoneum, and enable the incision to be safely made a few days afterward.

SECTION III.

GASTROTOMY.

This very difficult operation is sometimes rendered necessary by stricture of the œsophagus, the idea being to establish a fistulous orifice into the stomach for the introduction of food, etc.; or for the removal of bodies swallowed. It has never yet been done with permanent advantage in cases of disease, the longest duration of life after it having been twelve days; but it may afford a faint chance in cases in which death is otherwise inevitable, and perhaps a greater degree of success would be attained, were it resorted to earlier than it has been heretofore.

Operation.—The following was the procedure employed by Dr. F. F. Maury, of Philadelphia, in a case which occurred in his practice in 1869. An incision about seven inches long, slightly

curved, with its convexity outward, was made from near the sixth costal cartilage to a point an inch and a half above and to the left of the umbilicus. The fascia and sheath of the muscle having been divided, the muscular substance was torn through with the finger. Next, the tendon of the internal oblique and transversalis was divided, with the transversalis fascia; the peritoneum was thus exposed, and carefully incised, the precaution being taken of having the whole abdomen below compressed, in order to prevent the access of air to the peritoneal cavity. The stomach being now found, a silk ligature was passed through it, and the two ends confided to an assistant. Wire sutures were next passed through the wall of the stomach, including on either side the cut edges of the peritoneum and of the abdominal walls. An incision was now made into the stomach, and the middle portion of each of the wires just passed was pulled forward, and cut; by which each half of each wire was left simply penetrating the abdominal wall, the peritoneum, and the wall of the stomach; so that by twisting its ends together these structures were brought into apposition, and a gastric fistula provided for.

The patient lived only a few hours.

Foreign Bodies, such as coins, pins, buttons, or artificial teeth, are not unfrequently swallowed, and may lodge in the stomach or bowels. The domestic treatment of such cases is usually the administration of a purgative—a remedy which is, however, really unsuitable, as the object should rather be to delay peristaltic action, and to allow the foreign body to become enveloped in a mass of fecal matter, so that it may produce less irritation in its onward passage. If the foreign body cannot be extracted through the mouth, as has been successfully done in one instance by L. S. Little, and is of such a nature (as a table knife, or fork) that it cannot probably be either dissolved by the gastric and intestinal juices, or naturally evacuated, the surgeon would, I think, be justified, provided its position could be ascertained by external palpation, in attempting its removal by operation. *Gastrotomy* has, according to Durham, been successfully performed under these circumstances in seven, and according to Adelman, in eight cases; and as death would be, sooner or later, almost inevitable without operation, the attempt would be at

least permissible. The incisions, in such a case, should be regulated by the size and shape of the body to be removed, and the after-treatment should be the same as for an incised wound accidentally inflicted. *Enterotomy* might be similarly resorted to, if the foreign body, having reached the bowel, should cause complete intestinal obstruction.

SECTION IV.

OPERATION FOR THE CURE OF ARTIFICIAL ANUS.

Artificial Anus signifies a preternatural communication between the intestine and skin. It may be a consequence of penetrating wounds, of abscess or ulceration of the intestines, or of mortification of intestine in strangulated hernia, and it is sometimes purposely made by the surgeon in case of imperforate anus, in order to afford an exit for the feces. The external opening is irregular, everted, and red, and the surrounding skin excoriated. The aperture in the intestines adheres by its margin to the peritoneum, so that extravasation into the abdomen is prevented. That portion of intestines which is immediately above the aperture, and that portion which is immediately below it, meet at the artificial anus at a more or less acute angle, and present two orifices; one by which matters descend from the stomach, and another which leads down to the rectum. These two orifices are separated by a sort of crescent-shaped septum, formed by a projection of the mesenteric side of the bowel opposite to the aperture. Now it may readily be understood that the greater the aperture in the bowel, the more acute will be the angle at which the upper and lower portions meet, and the greater will the septum also be; and that, if the septum is large, it will act as a valve, and close up the orifice of the lower portion of bowel, causing any matters that come down through the upper portion to escape externally, instead of passing into the lower.

The *consequences* of this affection may be, 1, that the patient may die of starvatien, from the escape of the chyle, if the aperture is near the duodenum; 2, that a portion of the intestine may protrude and form a hernia; besides the constant disgusting annoyance occasioned by the escape of fecal matter and flatus.

Operation.—If the affection is of recent origin, and especially if it is consequent upon strangulated hernia, the patient should remain in bed, and great care should be taken to keep the parts clean; and then, perhaps, the external aperture may contract and cicatrize. If the latter is very small, and if the passage between it and the bowel is of some length (a state of parts termed *fecal fistula*), something may perhaps be done by compression, or by engrafting a piece of skin over the aperture; or by making an oval incision in the skin on each side of the aperture, and bringing the outer edges of the incision together by means of needles and the twisted suture; or by applying the actual cautery to the margin of the wound.

But if the loss of substance in the bowel is considerable, and the projecting septum large, the chance of recovery is not great. A pad of simple linen or lint may be worn to compress the aperture, and prevent discharge from it, or sometimes a hollow truss with a leathern or horn receptacle, may be used with advantage. Enemata are useful in all cases. Moreover, a tent may be thrust into both internal orifices, in order to enlarge the lower one, and repress the septum, as proposed by Dessault. As a last resource, a small portion of the septum may be nipped and strangulated by the forceps invented by Dupuytren for that purpose.

A most interesting and instructive* case of this kind, in which the abnormal anus was the result of an operation for strangulated umbilical hernia, occurred in the practice of Dr. G. D. Beebe, of Chicago, Ill., in which he removed forty-eight inches of intestines, with complete recovery of the patient. In his closing remarks on the above case, the Doctor says: "It is of interest as bearing upon the subject of artificial anus, since it demonstrates that these outlets may be safely closed after the lapse of a few days, and in this way getting rid of the loathsome inconveninces attending such circumstances. It is no less gratifying to the homœopathic surgeon to know the happy effects of homœopathic remedies in controlling the constutional disturbances consequent upon grave surgical operations as experienced in the above case, when the hiccough and prostration, the extensive cut surface of

* Transactions of the American Institute, 1871, p. 549.

mesentery returned within the abdomen, and the brevity of the viscera available for digestion and assimilation, all united to make the prognosis unfavorable. From no other source can the surgeon derive that confidence in the use of the knife in extreme cases which comes from a knowledge of the resources of the homœopathic materia medica." Certainly this case illustrates the value of homœopathic treatment in the most marked degree; and in hundreds of cases, from the mildest to the most serious, where life was in imminent jeopardy, can I add my testimony to the superior efficacy of this beneficent system, as compared with the uncertain and perturbating treatment of the allopathic school of medicine.

SECTION V.

INJURIES OF THE BLADDER.

The bladder may be ruptured (without external wound), by violence, as a kick, applied to the abdomen. This accident is only likely to happen if the organ be distended with urine, as when empty it sinks beneath the pubic arch, and is thus measurably protected from external injury. The rupture usually occurs in the posterior wall of the bladder, involving the peritoneal, as well as the other coats of the organ, and allowing urinary extravasation into the peritoneal cavity, an event which is almost inevitably fatal. More rarely the rent is confined to the anterior wall of the bladder, urine then escaping into the pelvic areolar tissue, and inducing a condition which, though very grave, is not so uniformly fatal as the one previously referred to. The symptoms, in the former case, consist of intense epigastric pain, collapse, urgent but fruitless efforts to urinate, and in a short time the ordinary signs of peritonitis; the introduction of the catheter serves to evacuate either none, or a very small quantity of bloody urine. If the peritoneum be not involved, the symptoms are less urgent, the patient being, in these cases, gradually worn out, by diffuse inflammation and sloughing of the areolar tissue.

The *operative treatment* consists in the introduction of a large flexible catheter, which (as a general rule) should be secured in place, the urine being allowed to run off constantly, by means of an

attached India-rubber tube, into any convenient receptacle. The patient should be got as soon as possible in bed, and warm arnicated lotions may be placed over his epigastrium and concentrated food administered, and the patient treated according to circumstances.

It has been suggested to perform *cystotomy* (as in the median or lateral operation for stone), in these cases, and if it were found impossible to keep the bladder empty by means of a catheter, the proposition might be reasonably entertained. Free incisions should be made on the first outward manifestation of urinary infiltration having occurred. A few instances are on record, in which the bladder has been ruptured by the accumulation of its own secretion; such an accident, however, is very rare, the urethra usually giving way, in such cases, rather than the bladder.

Wounds of the Bladder are amongst the most serious complications of fractures of the pelvis. The bladder may also be wounded by gunshot projectiles, by pointed instruments, by the horns of infuriated animals, etc. When the wound is in that part of the organ which is covered with peritoneum, these injuries are usually fatal, but there are numerous instances of recovery from wounds of the bladder inflicted in the *perineal* region. The treatment of these cases is essentially that which has been described in the preceding paragraph.

Foreign Bodies, such as slate-pencils, pins, etc., may be introduced into the bladder, through the urethra, through an external wound, or, more rarely (by the process of ulceration), from another viscus—as in a remarkable case recorded by Dr. Kingdon, in which a pin having been swallowed, lodged in the appendix vermiformis, from which it subsequently made its way into the bladder, where it formed the nucleus of a calculus; the ulceration by which this process was attended, gave rise to the formation of an intestino-vesical fistula, through which no less than six round worms entered the bladder, and were at different times discharged from the urethra. Foreign bodies may occasionally be spontaneously expelled from the bladder—or may be extracted with urethral forceps or a small lithotrite, if the surgeon succeed in catching them in the direction of their long axis. In the *male*, however, it is usually necessary to resort to lithotrity

(if the nature of the body admit of its being crushed), or to lithotomy, the *median* being in such a case the preferable operation. From the *female* bladder, foreign bodies may be conveniently removed, in most cases, by dilating the urethra with two or three-bladed forceps, or with graduated bougies, until the forefinger can be introduced, when it is very easy with forceps to seize and extract the foreign body, the finger serving to adjust it into a favorable position for removal. It occasionally happens that in using the *female catheter*, the instrument slips from the fingers, and is sucked into the bladder. In the event of such an unfortunate occurrence, the surgeon should *at once* dilate the urethra and remove the foreign body. Fatal ulceration has resulted under these circumstances, from the delay of only a few days.

Injuries of the Rectum.—*Wounds* of the recum, provided they are uncomplicated, usually heal without much difficulty, as is seen after the operation for fistula, or when the bowel is accidentally wounded in lithotomy. If the lesion involve the bladder or vagina, recto-vesical, or recto-vaginal fistula will probably result, and require the performance of a plastic operation. Death may follow perforation of the rectum (from the peritoneum being opened), as has occasionally happened from the incautious use of syringes, or of rectal bougies.

Foreign Bodies are occasionally found in the rectum, and must be removed with scoop or forceps, as the ingenuity of the surgeon, and the exigencies of each particular case, may suggest. The removal of masses of impacted feces, of seeds or fruit-stones, etc., may often be accomplished simply by the repeated use of warm enemata. A fish-bone, or similar article, may be caught in one of the pouches of the rectum, and, by the resulting ulceration, give rise to a fistula in ano.

CHAPTER V.

HERNIA.

SECTION I.

CAUSES.

Definition.—The term hernia signifies a protrusion of any portion of the viscera through an *abnormal* opening in the walls of the cavity within which the protruded part is naturally contained. But the word, used by itself, is restricted to signify protrusion of the abdominal viscera.

Causes.—The causes of hernia may be divided into such as pertain to the *general* condition of the patient, as age, sex, etc., and such as pertain to the *local* condition of the part in which the hernia subsequently occurs, which latter are called the *inciting causes*. The *immediate* or *exciting cause* of rupture, when any such can be alleged, is usually some violent exertion, as in lifting, coughing, straining, and violent crying.

General Predisposing Causes.—Age. The majority of cases of hernia are developed in infancy, or early adult life, a statement which has been clearly established by the researches of Mr. Kingdon, of the City of London Truss Society, and verified by Dr. N. W. Hubbard, of New York City, who treated upward of fifteen thousand cases during his practice, and others who have given this subject their exclusive attention.

Sex.—The male sex is unquestionably more predisposed to the occurrence of hernia than the female, the difference being most marked in infancy and early childhood on account of the causes which will be referred to under the heading of *local or inciting causes.*

Occupation also acts as a predisposing cause, the majority of cases of hernia in adult life occurring among the laboring classes, and produced by compression of the viscera by the action of the muscles that surround them, as in violent bodily exertion, lifting heavy weights, etc., etc., especially if the person has been previously weakened by illness.

The anatomical peculiarities on which the frequent occurrence of hernia at the early age of infancy depends, are, first, imperfect closure of the ventral orifice of the vaginal process of the peritoneum, and persisting patulousness of that canal, and abnormal lengthening of the cord.

Local or Inciting Causes.—Wounds or *subcutaneous lacerations* of the abdominal parietes predispose to the formation of a hernial tumor, as also weakening of the walls of the abdomen, as the result of previous inflammation, abscess, the pressure of the gravid uterus, the development of ovarian tumors, accumulation of fat in the omentum or mysentery.

A *patulous condition of the vaginal process of the Peritoneum, or of its ventral orifice*, is the most frequent predisposing cause of hernia. It is known that in the earlier periods of fœtal life, the testes are situated in the lumbar region, whence they gradually descend into the scrotum. During their descent, they are behind and partially invested by the peritoneum, a prolongation of which membrane is pushed ahead of the testicle into the scrotum where it forms the tunica vaginalis on either side. This peritoneal covering first forms one common sac with that of the peritoneum itself, and the communication between them often persists at birth, or even a month or two later; usually, however, about the period of birth, the vaginal process divides into two portions, by the contraction of the sheath and the formation of adhesions between its sides, at about the position of the head of the epididymis. The lower portion invests the testicle, forming the *tunica vaginalis propria testis*, while the upper portion lying in front of the spermatic cord forms the *tunica vaginalis propria funiculi*. It not unfrequently happens that the *funicular* portion of the vaginal process persists as a tube of small calibre, closed at both ends, or, more rarely its ventral or testicular orifice, or both, remain patulous, and predisposes the person in whom it exists to the occurrence of hernia. The testicular orifice, is, of course, that by which the funicular portion communicates in fœtal life with the testicular portion of the vaginal process of the peritoneum, while the ventral orifice is that by which it communicates with the general cavity of the peritoneum, and corresponds in position with the internal abdominal ring

with this condition existing, and taking into consideration the well attested fact that the *right* testicle of the infant after birth is retained in its sac, and is later in descending into the scrotum than the testes on the left side, with the corresponding observation that the appendages of the right testicle are shorter and firmer than those of the opposite side; and furthermore, that herniæ of the right side are more frequent than those of the left, offer an explanation why herniæ in infant life occur more often on the right side. It is said by Dr. Hubbard, above quoted, that his hernial statistics (over fifteen thousand cases) disclose the important fact that more than two-thirds of the cases of congenital hernia occur on the right side, and more than three-fifths of oblique inguinal hernia in adults are on the same side, and undoubtedly caused by the fact that in the *late* descent of the testicle on the right side the adhesions at the internal ring do not become as firmly consolidated as before birth.

The viscera most liable to hernial protrusion are the small intestines, omentum, and arch of the colon. But every one of them has occasionally been found protruded, partially or entirely —especially in cases of congenital deficiency of the abdominal parietes.

The *sac* of a hernia is a portion of the *parietal* or *reflected* layer of peritoneum which the protruding viscera push before them in their escape, and which forms a pouch containing them. It very soon contracts adhesion to the surrounding cellular tissue, and consequently does not return into the abdomen when the viscera are replaced, although it must be observed, that a hernia may be pushed back *en masse*, sac and all, when great force is used in reducing a strangulated hernia. As the hernia increases in size, the sac also increases; partly by growth, partly by distension, and slight laceration or unravelling; partly by fresh protrusion of peritoneum. Sometimes it diminishes in thickness whilst increasing in capacity; sometimes, on the contrary, it becomes thick, indurated, and divisible into layers. Its *neck* (the narrow part which communicates with the abdomen) always becomes thickened, rigid, and more or less puckered, in consequence of the pressure of the muscular or ligamentous fibres which surround it. Sometimes the sac has two constricted por-

tions, or *necks*—either because (as in oblique inguinal hernia) it passes through two tendinous apertures—(the external and internal abdominal rings)—or because the original neck has been pushed down by a fresh protrusion. Some herniæ, however, are destitute of a sac, or at least of a complete one. This may happen,—1. If the protruded viscus is not naturally covered by peritoneum; as the cæcum. 2. If the hernia occur in consequence of a penetrating wound. 3. In some cases of congenital umbilical hernia. 4. Hernia may be considered virtually without a sac, if the sac has been burst by a blow, or if it has become entirely adherent to its contents. Instances, again, are known in which two peritoneal sacs have protruded through one and the same aperture in the abdominal parietes; and in which one sac has come down within a previously-existing one.

Division.—Hernia is divided into several species: according to its *situation*—as the inguinal, femoral, etc.; according to the *condition of the protruded viscera;* which may be, 1, *reducible,* or returnable into the abdomen; 2, *irreducible*, that is, not returnable into the abdomen; or 3, *strangulated*, that is, subject to some constriction, which not only prevents their return into the abdomen, but also interferes with the passage of their contents, and with their circulation.

SECTION II.

INGUINAL HERNIA.

Definition.—Inguinal hernia is that which protrudes through one or both abdominal rings.

Varieties.—There are four varieties. The oblique, direct, congenital, and encysted.

1. The *oblique* inguinal hernia is the most common. It takes precisely the same route as the testicle takes in its passage from the abdomen into the scrotum. It commences as a fullness or swelling at the situation of the internal abdominal ring, that is to say, a little above the centre of Poupart's ligament, next passes into the inguinal canal (and in this stage is called *bubonocele*), and if the protrusion increase, it projects through the external ring, and descends into the scrotum of the male, or

labium of the female. The *coverings* of this hernia are, 1, skin. 2. A strong layer of condensed cellular tissue derived from the *superficial fascia* of the the abdomen, in which the *external epigastric artery* ramifies. With this is mostly incorporated, 3, the *fascia spermatica*, a tendinous layer, derived from the inter-columnar bands, a set of semi-circular fibres, which connect the two margins of the external ring. Under this lies, 4, the *cremaster muscle*, sometimes called *tunica communis*. 5. Next comes the *fascia propria*, a cellular layer continuous with the *facia transversalis* of the abdomen; and lastly, 6, the sac. The *internal epigastric artery* is always internal to the neck of the sac. The *spermatic cord* is generally behind the sac; but in old cases, the parts which compose the spermatic cord are separated by the tumor, so that the vas deferens and spermatic artery lie sometimes in front, sometimes on either side of it.

The *direct* inguinal hernia bursts through the *conjoined tendon* of the internal oblique and transvesalis muscles, just behind the external ring. Its coverings are the same as those of the oblique variety, except the cremaster, for it has no connection with the cord. The epigastric artery runs external to the neck of the sac. This hernia may, however, push the conjoined tendons before it, instead of bursting through it. The spermatic cord generally lies on its outer side.

The *congenital* hernia is a variety of the oblique, and is so called because the state of parts which permits of it only exists at or soon after birth. A portion of omentum or intestine accompanies the testicle in its descent, and passes down with it into the very pouch of peritoneum which forms the *tunica vaginalis reflexa*, before its communication with the general peritoneal cavity has become obliterated. The sac of this hernia is consequently formed by the tunica vaginalis; its coverings in other respects are the same as those of the oblique variety, and the protruded bowel lies in immediate contact with the testicle, and if not replaced generally adheres to it.

The *encysted* (or *hernia infantilis*) is a sub-variety of the cogenital. The protruding bowel pushes before it a sac of peritoneum either into or close behind the tunica vaginalis, and

this tunic and the sac adhere very closely together. This hernia, therefore, has, as it were, two sacs: viz., one proper sac, and another anterior, composed of the tunica vaginalis, which in these cases is very liable to be the seat of hydrocele.

Diagnosis.—The difference between the *oblique and direct inguinal hernia*, and their relations to the epigastric artery, are as follows. In the oblique, the neck of the tumor inclines upward and outward, and causes a fullness extending up to the middle of Poupart's ligament. See Fig. 378. In the direct, it inclines (if at all) rather inward; and when the hernia is reduced, the finger, carrying integument before it, can be passed straight back into the abdominal cavity. See Fig. 379. But in old cases of oblique hernia, the neck of the sac is dragged down toward the middle line, so that all distinction is lost.

Hydrocele may be distinguished from hernia by its beginning at the bottom of the scrotum; by its being semi-transparent and fluctuating, and preventing the testicle from being clearly felt (whilst the cord can be distinctly felt above it); and by not dilating on coughing. Whereas hernia begins at the top of the scrotum; it is not transparent; does not fluctuate; does not prevent the testicle from being clearly felt, although it obscures the cord; and dilates on coughing. But hernia may and does often coexist with hydrocele, the former beginning from above, the latter from below. Moreover, a hernia, consisting of intestine greatly distended with flatus, has been known to be as transparent as a hyrocele.

Hydrocele of the Cord, if low down, may be distinguished by its transparency and fluctuation; but if high up, it may extend into the abdominal ring, and receive an impulse on coughing, and the diagnosis be very difficult. But as a hernia may be concealed behind this kind of tumor, the rule, *when in doubt, operate*, should be acted upon in case of symptoms of stragulation.

Varicocele (or *cirsocele*), which signifies a varicose enlargement of the spermatic veins, resembles hernia, inasmuch as it increases in the erect posture, and perhaps dilates on coughing; but it may be distinguished from hernia by its feeling like a bundle of tightly-distended veins; and although, like

hernia, it disappears when the patient lies down, and the scrotum is raised, still it quickly appears again, if pressure be made upon the external ring, though that pressure would effectually prevent a hernia from coming down again.

Lastly, a testicle that has not come down through the external abdominal ring into the scrotum, has been frequently confounded with a *bubonocele*, or small hernia in the inguinal canal; and has been compressed with a truss, to the great pain and detriment of the patient. A little care and attention will prevent this mistake.

Treatment.—Inguinal hernia, if *reducible*, must be kept up with a truss. Care must be taken not to let the pad bear against the spinous process of the pubes, or the spermatic cord.

Radical Cure.—From the earliest times attempts have been made to produce a radical cure of this kind of hernia, especially by measures calculated to obliterate the sac. Thus, excision of the sac, and of the testicle with it;—ligature of the sac;—pressure by hard trusses; injection of iodine; the use of caustics, so as to produce a slough and subsequent firm cicatrix; the introduction of isinglass, blood, and goldbeaters' skin, have been practiced with much danger and little success. At present there are operations of established repute, which act by plugging up and closing the herniary apertures, which will be pointed out at the close of the chapter.

SECTION III.

FEMORAL OR CRURAL HERNIA.

Definition.—Femoral hernia is that which escapes behind Poupart's ligament.

It passes through the *crural ring*—an aperture bounded internally by *Gimbernat's ligament*—externally by the femoral vein—before, by Poupart's ligament—and behind by the bone. It next descends behind the *falciform process* of the fascia lata; thirdly, it comes forward through the *saphenic opening* of that fascia; and lastly, as its size increases it does not descend down on the thigh, but turns up over the falciform process, and lies on the anterior surface of Poupart's ligament. The *coverings* of

this hernia are—1. Skin. 2. The *superficial fascia* of the thigh, loaded with fat, and divisible into an uncertain number of layers. 3. *Fascia propria*, a layer of cellular tissue derived from the sheath of the femoral vessels, or according to others, from the *fascia cribriformis* which closes the saphenic aperture. It is in general pretty dense about the neck of the hernia, but thin, or even deficient on its fundus. 4. The sac. Between the last two there is often found a considerable layer of fat, which might be mistaken for omentum.

Femoral hernia rarely attains a very large size. It is much more frequent in the female than in the male, obviously from the greater breadth of the pelvis.

Diagnosis.—Femoral hernia may be distinguished *from the inguinal* by observing that Poupart's ligament can be traced over the neck of the sac, and that the spinous process of the pubes lies internal to it; whereas it is the reverse in the inguinal hernia. Besides, the femoral is generally much smaller. Supposing that a large femoral hernia is so fixed that it will not allow the course of Poupart's ligament to be traced, the diagnostic mark pointed out by James, of Exeter, may be attended to, to-wit, that an inguinal hernia descends toward the labium, a femoral may mount up to near the spinous process of the ilium.

Psoas abscess resembles this hernia in its situation, in dilating on coughing, and diminishing when the patient lies down. The points of distinction are, that it is generally more external, that it fluctuates, but does not feel tympanitic, and that it is attended with symptoms of disease of the spine.

Varix of the femoral vein also resembles this hernia, inasmuch as it dilates somewhat on coughing, and diminishes when the patient lies down; but then if pressure be made below Poupart's ligament, the swelling quickly reappears, although it must be evident that under such circumstances a hernia could not come down.

Bubo and other tumors of the groin may in most cases be recognized by their general character and history, and by their being unattended with symptoms of inflammation or obstruction of the bowels. But if there be any such swelling, and symptoms of strangulation as well, an incision should certainly be

made to examine it; for there may be a tumor that may be satisfactorily proved to be an enlarged gland, and yet there may be a small knuckle of intestine strangulated behind it.

Lastly, the possibility of there being a strangulated *obturator hernia* behind the femoral hernia should not be lost sight of.

Treatment.—The *reducible* femoral hernia should be supported by a truss, the pad of which should tell against the hollow which is just inferior and external to the spinous process of the pubes. This hernia is very seldom, if ever, cured radically.

The *irreducible* should be supported by a truss with a hollow pad; or perhaps, (if it be omental) the pressure of a common pad may be borne.

SECTION IV.

REDUCIBLE HERNIA.

Symptoms.—A soft compressible swelling appears at some part of the abdominal parietes. It increases in size when the patient stands up; if grasped, it is found to dilate when he coughs or makes any exertion; and it diminishes or disappears when he lies down, or when properly-directed pressure is made upon it. If the sac contains intestine (*enterocele*), the tumor is smooth, rounded, and elastic; *borborygmi* (or flatulent croakings) are occasionally heard in it, and when pressed upon, the bowel returns into the abdomen with a sudden jerk and gurgling noise. [It is moreover resonant on percussion.] If, however, it contains omentum (*epiplocele*), the tumor is flattened, inelastic, flabby, and unequal to the touch, and when pressed, it returns without noise, and very slowly, the pressure requiring to be continued till it has nearly disappeared. But very often one hernial sac contains both intestine and omentum (*entero-epiplocele*); and very frequently it is perfectly impossible to ascertain which it contains by any external examination.

Treatment.—This may be palliative or radical. The usual plan is, to employ a *truss*, an instrument consisting of a pad placed on the seat of protrusion, and of a steel spring which passes round the body, and causes the pad to press with the requisite degree of force. In writing for a truss it is usual to give the circumference

of the body at the hips, midway between the spine of the ilium and the trochanter. The patient must expect to find the truss rather irksome for the first week. It should be constantly worn by day; and if the patient will submit to wear it at night, also, so much the better. If he will not do this, he should, at all events, apply it in the morning, before he rises from the recumbent posture. The skin of the part which it presses upon should be regularly washed, and bathed with *Arnica* lotion, else large boils are apt to form on it.

Palliative Treatment.—This consists in preventing the descent of the hernia by the application of a suitable *truss* or *bandage*. In cases of umbilical and ventral rupture, an elastic band and pad may be the best means of retention, but a truss is preferable for the ordinary forms of hernia. I do not purpose to enter into any discussion of the comparative merits of the many forms of truss which are offered by their respective inventors to the profession and the public, but shall merely mention what may be considered the requisites of a good truss.

A *Truss* consists essentially of a *pad* and a *spring*; the *pad* should be firm, slightly convex upon the surface (except in particular cases) of an oval or elongated triangular shape, and sufficiently large to compress not only the aperture through which the hernia escapes, but the whole canal through which it has passed to reach the surface. The pad may be of buckskin, firmly stuffed, of polished wood, or of such other material as may be found by experience to produce least irritation of the skin, some patients in this respect differing from others. In certain cases, in which the ring through which the hernia protrudes is very large, the ordinary convex, oval or triangular pad, may be advantageously replaced by one of a horse-shoe or ring shape, as recommended by Mr. J. Wood. As a rule, the plate which forms the back of the pad should be made of the same piece of metal as the spring, while the bearing of the pad should not be directly inward, but somewhat upward as well, the particular angle varying according to the shape of the patient's abdomen. The *spring* of a truss is made of metal (covered with buckskin or leather), and curved so as to pass around the patient's trunk, just above the rim of the pelvis; it should not touch except at the point of counterpressure,

which, in the ordinary single-pad truss, is at the patient's hip, on the opposite side to that of the rupture—and at this point the spring should be beaten thin, curved to fit the part, and suitably padded. The spring should be elastic, and should exercise just enough force to keep the hernia reduced, without pressing so deeply as to cause absorption of the abdominal parietes. From the free end of the spring, a leather strap passes to the pad, thus completing the circle around the patient's pelvis, while, for additional security, another strap may pass from the body of the spring along the fold of the buttock and around the inside of the thigh, to be fastened to a button at the lower edge of the pad.

In many cases, particularly in those of persons with fat and pendulous abdomens, it is difficult to keep a hernia reduced except by using a spring of such power as to produce great discomfort, beside incurring the risk of encouraging the development of a rupture on the opposite side; under such circumstances, it may be better to employ a double-pad truss, thus affording support to both sides of the abdomen. The points of counterpressure, when such an instrument is used, are situated on either side of the spine. The double-pad truss is, of course, necessary in cases of *double hernia.*

Before applying a truss the hernia should be completely reduced, and the apparatus then adjusted, while the patient is in the recumbent posture; the truss may be left off at night, being removed after the patient is in bed and re-applied before he rises, but should be constantly worn at other times. Every one who is ruptured should be provided with at least two trusses, so that if one break, another may be immediately substituted; and it is well to have one furnished with a plain wooden pad, for use while bathing, etc. If the pad of a truss tend to produce chafing, as is apt to be the case in hot weather, the part should be frequently washed with *Arnica* water, and welldusted with ordinary toilet powder, or *Lycopodium.* The necessity of constantly wearing the truss, and of never permitting the descent of the hernia, cannot be too strongly insisted upon. The only circumstance which should be allowed to prevent the use of the instrument, is the presence of an undescended testis in such a part of the inguinal canal as to render the pressure of the truss-pad unbearable; and

even such a case should not be abandoned, without an attempt to effect the desired object by trying various forms of apparatus.

As a test for the efficiency of a truss, Erichsen advises that the patient should be directed to cough, while sitting on the edge of a chair, leaning forward, and with the legs extended and widely separated; if the hernia do not slip down behind the pad under these circumstances, the instrument may be considered satifactory.

Radical Cure of Hernia.—In those cases in which the vaginal process of the peritoneum constitutes the sac of a hernia (*congenital sac*), the application of a well-fitting truss will occasionally effect a cure (particularly if the patient be an infant), by inducing the formation of adhesions between the opposing sides of the canal, and thus imitating the process of nature in accomplishing the closure of the part. In the other forms of hernia, in which the sac is slowly developed (*acquired sac*), it may be possible to *prevent* the formation of the sac by the employment of a truss; but when once formed, all that can usually be hoped for, in the use of the instrument, is to check the further enlargement of the sac by keeping the hernia constantly reduced. Hence, although when provided with a suitable truss, a person who is ruptured may go through a long life with safety and comfort, it is not strange that attempts should have been made to effect a radical cure of hernia by other means.

Castration, excision of the sac, ligation or scarification of its neck, and acupuncturation, have at various times been recommended and practiced, but are now matters chiefly of historical interest. The injection of the sac with tincture of *Iodine*, has been advantageously resorted to by Professor Pancoast. Gerdy's operation, which consisted in simply invaginating a portion of the sac and superjacent integuments, by pushing them up with the finger into the canal through which the rupture descended, and holding them there with sutures, while adhesion was promoted by the application of liq. *Ammonia* to remove the cuticle of the invaginated part, has been revived with various modifications and improvements by Syme, Fayrer, Wutzer, Wells, Davies, Armsby, D. H. Agnew, and others; while another very ingenious procedure, combining invagination with ligation of the neck of the sac, has been devised by J. Wood, of King's College, London.

The subcutaneous employment of the silver-wire suture has been recently recommended by Richardson, of New Orleans, and by Chisolm, of Maryland. The more important operations for the radical cure of hernia will be described under the heads of the special forms of the disease for which they are adapted; but it will be convenient to refer, in this place, to the general question of the applicability of such modes of treatment.

The objections to any operation for the radical cure of hernia are 1st, the *risk* by which the procedure is necessarily attended, and 2nd, the probability of *failure* by the hernia recurring in spite of the operation.

There is, in the first place, the *risk* of inflicting direct injury upon important vessels, the peritoneal cavity, or even the bowel itself. A skillful operator could doubtless avoid these accidents, yet the possibility of their occurrence should be borne in mind in estimating the dangers of the procedure. But even if no such untoward event as has been referred to mars the progress of the operation, it is evident that in every case there is necessarily a risk of the development of peritonitis; for every operation aims to effect a cure by inducing a certain amount of inflammation in the neck of the sac, and it is impossible to be sure that this inflammation may not spread further than is intended. And, although the statistics of various modes of operating show that but few deaths have actually occurred from peritoneal inflammation, in proportion to the number of cases in which the operations have been performed, yet, as justly remarked by Birkett, these facts only show that peritonitis is not a necessary consequence of the procedure.

If, however, the chance of a fatal termination is small, the probability of *failure* is comparatively great. Mr. Wood* has pointed out that the main cause of failure, in most operations for the radical cure of hernia, lies in the neglect to include the posterior wall of the canal in the part operated on, the rupture sooner or later redescending behind the seat of operation; and hence a prominent feature in his own mode of procedure, consists in drawing forward the posterior wall of the canal, so as to

* On Rupture, etc. London, 1868, p. 147.

induce its adhesion to the anterior; yet of the sixty cases reported in his work, one ended in death, and eleven in failure; of six more, the termination was doubtful; while of the forty-two recoveries, ten had not been heard from since their discharge from hospital—so that the positively ascertained number of permanent recoveries, which he was then able to report, was but little more than half of the number operated upon.* Another cause of failure, which equally affects every form of operation, is strongly insisted upon by Birkett, though denied by Wood; this is the existence of relaxation and elongation of the mesentery, which will, when present, tend to allow the reproduction of the rupture in the same or another part.

Hence it would appear that the most favorable view to be taken of any operation which has been as yet proposed for the radical cure of hernia, is that while not necessarily followed by grave consequences, it is not unattended with risk, and by no means certain to effect the object designed; and that in consideration of the safe and really satisfactory means of palliation afforded by the use of a truss, the radical treatment must be looked upon as at best an operation of complaisance or expediency. The most favorable cases for operation are probably those of hernia into the vaginal process or its funicular portion, the so-called congenital or infantile cases; for, as remarked by Birkett, it is almost exclusively in these cases that a natural tendency to spontaneous cure has been observed. The operation is doubtless justifiable in exceptional instances, as when it is found impossible to maintain reduction by means of a truss, or when the occupation of the patient or other causes render the inconvenience of wearing a truss more than ordinarily burdensome; but, though occasionally justifiable, the operation is not, in any case, one to be urged upon the patient, nor to be performed without his fully understanding the uncertainties and dangers of the procedure: and in the immense majority of cases the surgeon will best consult both his own reputation and the good of his patient, by dissuading from any but palliative treatment.

* According to Druitt, however (Surgeon's Vade Mecum, 10th edit.), of 155 cases operated on by Wood up to 1870, 113 are to be classed as recoveries, and only 2 proved fatal.

SECTION V.

IRREDUCIBLE HERNIA.

Definition.—Hernia is said to be *irreducible*, simply, when the protruded viscera cannot be returned into the abdomen; although there is no impediment to the passage of their contents, or to their circulation.

Causes.—Hernia may be rendered irreducible, 1, by an adhesion of the sac to its contents, or of the latter to each other, or by membranous bands formed across the sac. 2. By enlargement of the omentum or mesentery—whether from simple deposition of fat, or from sarcomatous or other organic change. 3. Omental hernia may be rendered irreducible by a contraction of that portion which lies in the neck of the sac, so that it is not stiff enough to stand against the pressure intended to push it back into the abdomen, but doubles up under it.

Consequences.—Irreducible hernia may produce sundry inconveniences. In the first place, the patient is often liable to dragging pains in the abdomen, or perhaps attacks of vomiting, which come on after food, or when he assumes the erect posture, because the protruded omentum or intestines being fixed, resist all distension or upward movement of the stomach. These inconveniences will be greatly aggravated, if the patient increase in corpulency, or become pregnant. Moreover, the protruded bowels being deprived of the support naturally afforded them by the abdominal muscles, their feculent contents are apt to lodge in them, and frequently cause colic or constipation. Lastly, the bowel is greatly exposed to external injury, and in constant hazard of strangulation.

Treatment.—This may be either palliative or radical. The *palliative* treatment consists in applying a hollow bag truss, or else a truss with a hollow pad that shall firmly embrace the hernia, and prevent any additional protrusion. The patient should avoid all violent exertion or excess in diet, and should never let his bowels be confined.

Radical Cure.—It has occasionally happened, after confinement to bed for several weeks with fever or some other emaciat-

ing ailment, that a hernia, irreducible before, has been replaced with ease, owing to an absorption of the fat of the omentum or mesentery and relaxation of the abdominal apertures. The same result has also in some cases been effected by art—by keeping the patient in the recumbent posture and on very low diet for six weeks or two months, and by the frequent use of glysters and laxatives, and at the same time by keeping up a constant equable pressure on the tumor by means of a bag truss made to lace over it. This plan is very uncertain as to its results, and will be effectually defeated if there are any adhesions; and, besides, there are not many patients who will submit to it. It will be more likely to succeed if the hernia is omental, than if it contain intestines. But several instances are known, in which, after the contents of old herniæ had been replaced, they produced so much irritation in the abdomen, that the patients were glad to compound for their life by keeping the hernia. Any surgical operation with the view of opening the sac, dividing adhesions, and returning the parts into the abdomen, is scarcely justifiable, as it would be exposing life to too great a hazard.

SECTION VI.

STRANGULATED HERNIA.

Definition.—Hernia is said to be strangulated, when it is constricted in such a way, that the contents of the protruded bowel cannot be propelled onward, and the return of its venous blood is impeded.

The *causes* of strangulation may be, 1. A sudden protrusion of bowel or omentum through a narrow aperture, in consequence of violent exertion; a thing not unlikely to happen if a truss has been worn for some time, and then is carelessly left off. 2. Distension of the protruded intestines by flatus or feces, or tumefaction and congestion of the omentum or mesentery. 3. Swelling of the neck of the sac may be a cause; and *spasm* was formerly considered so.

The *seat of stricture* is either the thickened portion of peritoneum which forms the neck of the sac, or tendinous bands external to it. In some cases the bowel has been constricted by

membranous bands, or by fissures in the omentum within the sac itself. But it must be recollected that the membranous aperture, through which the displaced bowel passes, does not exert any active force upon it;—on the contrary, it is the ruptured part which has been squeezed into a narrow aperture, and is pressing outwardly against that aperture. Yet the effect is the same in either case.

The *symptoms* of strangulated hernia, are, *first*, those of obstruction of the bowels; *secondly*, those of inflammation. The patient first complains of flatulence, colicky pains, a sense of tightness across the belly, desire to go to stool, and inability to evacuate. It is true that stools may be passed if there be any fecal matter in the bowel below the hernia, or if the hernia be entirely omental, but with very transient relief. To these symptoms succeed vomiting of the contents of the stomach, then of mucus and bile, and lastly of matters which have acquired a *stercoraceous* appearance by being delayed in the small intestines. On examination the surgeon finds a rupture, which he cannot put back, and which is uneasy, tense, and incompressible. The communication between the abdomen and the misplaced bowel is almost, or if the stricture be tight, is quite interrupted; and therefore the impulse felt on coughing is either diminished or altogether lost. Moreover, as Mr. Luke very clearly pointed out, if the hernial tumor is examined with both hands, and if one hand is employed in grasping the body of the tumor, and two fingers of the other in feeling near the neck of the tumor for the impulse created by each act of compression, it will be found that the sensation of impulse will cease to be felt at the part where the stricture exists; and will not be felt all along the neck of the hernia, as it would if no stricture existed. If this state of things continue, the inflammatory stage comes on. The neck of the sack becomes tender, and tenderness diffuses itself over the tumor and over the abdomen, both of which become very painful and much more swelled. The countenance is anxious; the vomiting constant; the patient restless and despondent; and the pulse small, hard, and wiry. After a variable time, the constricted parts begin to mortify. The skin becomes cold, the pulse very rapid and tremulous, and the tumor dusky red and emphysema-

tous; but the pain ceases, and the patient having perhaps expressed himself altogether relieved, soon afterward dies.

Varieties.—There is often considerable diversity in the rapidity and violence of these symptoms. If the patient is a strong adult, and the strangulation has commenced suddenly with a fresh protrusion during some forcible exertion, the inflammatory stage may come on instantly, and be followed by death in a very few hours. On the other hand, if the patient is old, if the hernia has been long irreducible, and has a large neck, and if the strangulation is produced by distension of the protruded bowel with flatus or feces—the symptoms of mere obstruction may last many days, before those of inflammation come on. To this latter class of cases the term *incarcerated* is applicable.* Again, if the hernia be omental, the symptoms will probably be less acute than if it be intestinal; but not much less. Even if a portion of the calibre of the bowel is constricted, and not the whole—so that a passage may be left—the symptoms will be the same.

Morbid Appearances.—After death from strangulated hernia, the bowels are found reddened, the upper portion of them much distended, and there are effusions of turbid serum and lymph. Around the sac the tissues are œdematous or emphysematous. The strangulated intestine is dark, claret-colored, and turgid with blood, roughened in patches by a coating of lymph; —or displaying patches of gangrene, in the form of greenish or ash-colored spots, which break down under the finger. The mucous and muscular coats, where they have been subjected to the pressure of the stricture, are liable to be ulcerated. The omentum is dark red; if gangrenous, it feels crispy and emphysematous, and the blood in its veins is coagulated. The sac also contains bloody serum.

Treatment.—The indications are, to return the intestine, or such portion of it as may be reducible; and for this purpose to divide any constricting part, if necessary.

The Taxis.—This is a Greek word, absurdly and pedantically used to signify the acts of gentle pressure with the hands, by

* There is great confusion in the use of these terms, as some surgeons employ the term *incarcerated* to signify what is generally known as *irreducible* hernia.

which herniæ are reduced. The bladder having been emptied, the patient should lie down in an attitude of complete repose, and be put under the influence of chloroform ; if this be not used, he may be made to lie in a warm bath, with his shoulders raised; and both his thighs should be bent toward the belly, and be placed close to each other, so that every muscle and ligament connected with the abdomen may be relaxed. If not etherized, he should be engaged in conversation, to prevent him from straining with his respiratory muscles. In order effectually to remove the expulsive force of the diaphragm, Dr. Buchanan, of Glasgow, directs the patient to make a deep expiration, and to abstain from drawing in the breath as long as possible. Then the surgeon, if the tumor be large, grasps it with the palms of both hands, firmly compresses it, so as to squeeze out a little flatus and venous blood, and occasionally with his fingers gently moves the parts at the neck of the tumor, or perhaps tries to pull them very gently downward, in order if possible to dislodge them.* This operation may be continued for a quarter or a half an hour, or longer, if the tumor is indolent, but not so long if is tender ; and at last, perhaps, the surgeon will be delighted to hear a gurgling sound accompanying the return of a portion of intestine. The operator should recollect that too much force may bruise or rupture the viscera, or drive sac and all into the abdomen, or push them between the layers of abdominal muscles, and that he must not be satisfied with a partial reduction of the volume and tension of the tumor, if the vomiting remains unrelieved; because, as Mr. Mayo has shown, such a diminution might be caused by merely forcing the serum contained in the sac into the abdominal cavity.

If the taxis do not succeed, certain auxilliary measures are commonly resorted to.

The first to be mentioned is *chloroform* or *ether*, or a mixture

* Mr. T. Hunt, late of Herne Bay, now of Alfred Place, in a communication with which he has favored the author, condemns all kneading and pushing, and says that he believes that gentle, long-continued, and equable pressure will reduce every hernia, provided time and gentleness are allowed for the operation. Mr. Hunt's opinion is grounded upon numerous cases during a practice of thirty years.

of the two, as before directed, inhaled till it produces complete relaxation and unconsciousness.

The *hot bath* (96 deg.—100 deg. F.) continued long enough to produce great relaxation is useful in similar cases; but it must be recollected that a delicate person will not be very likely to bear the shock of an operation, if bled or boiled to death's door first of all.

The *tobacco enema* has certainly been successful in many cases, especially of inguinal hernia; but it is a most dangerous remedy. It has proved immediately fatal to some patients, and has rendered others incapable of surviving the shock of the operation.

Cold applied to the *tumor* by means of pounded ice or a freezing mixture in a bladder, is a remedy commonly enumerated; and is said to be most applicable to large scrotal herniæ when the symptoms are not very urgent. But it is not without its hazards; as cold applied and continued for any length of time over the *point of stricture*, will increase the contractibility, and therefore retard the introduction of the sac within the abdomen.

Surgical Anatomy of Inguinal Hernia.—Inguinal hernia is that form which occurs just above Poupart's ligament, while femoral occurs below it.

Inguinal hernia, when it passes down through the abdominal canal, following the course of the spermatic cord, is called *oblique* or *indirect;* when it escapes at once through the external ring, without coming through the canal, it is called *direct.* These two forms, which will be explained presently, cannot always be distinguished from one another in practice.

The inguinal canal is a tube-like process of transversalis fascia, about an inch and a half long. When, after the seventh month of fœtal life, the testicle descends from the lumbar region, it comes down along the psoas muscle, takes with it a double covering of peritoneum, pushes before it a glove-finger-like process of the transversalis fascia, and several fibres from the lower edge of the transversalis and internal oblique muscles (which are here blended); it travels behind the external oblique tendon toward the median line until it comes to a triangular opening in the ten-

don, and then passes forward through this opening, taking another covering from the thin fascia (intercolumnar) which stretches across it. This triangular opening is called the external superficial *abdominal* or *inguinal ring*; the point where the process of transversalis fascia begins is called the internal deep *abdominal* or *inguinal ring*. After the testicle has passed out of the external ring, it gets a covering from the superficial fascia and skin; while its vessels, nerves, and duct continue to occupy the canal.

When a hernia comes down through the canal, it will have the following layers of tissue as coverings: skin, superficial fascia, intercolumnar fascia, cremaster muscle (the fibres derived from the blended internal oblique and transversalis muscles), transversalis fascia, and peritoneum.

Now this process of peritoneum constitutes what is called the hernial sac. The mode of its formation is shown in Fig. 376.

Fig. 376.

Fig. 377.

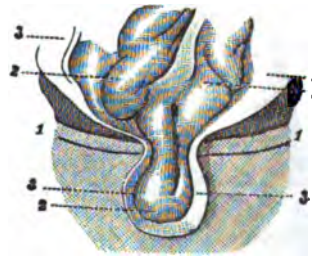


Fig. 377 shows how the bowel, once protruded, swells somewhat outside of the point when it escapes, and produces the sac which is also shown. Fig. 377 is a plan of the sac: 1, 1, the abdominal parietes; 2, 3, 3, the fundus; the upper figures 2, 3, 3, 4. the intestines within the peritoneum. The same figures refer alike to both cuts.

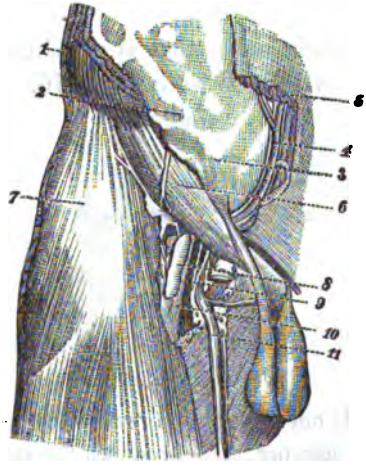
Should a portion of bowel, or omentum, or both, come down along the canal, it lies in front of the spermatic vessels, nerves, and duct.

Direct inguinal hernia, much more rare than the indirect, is a protrusion through the external ring, with the same coverings as in the former case, except that we have the conjoined tendon of the internal oblique and transversalis muscles instead of the cre-

master, and a new process of the transversalis fascia instead of the infundibuliform or tube-like process which forms the inguinal canal.

The great difference between these two forms of hernia is in their relation to the epigastric artery. This vessel, taking its origin from the external iliac just before it becomes the femoral, runs up behind and to the inner side of an oblique or indirect hernia, while it lies to the outer side of a direct one. Now the importance of this point is that an indirect hernia of long standing will gradually distend the parts just about its neck, until it assumes the appearance of a direct one; and thus in operating, if the stricture is divided inward, the epigastric artery may be cut.

Fig. 378.



In Fig. 378, the parts concerned are shown. The skin, superficial fascia, and muscles have been dissected away so as to show the transversalis fascia, 2; the commencement of the canal at the internal or deep ring, 3; the epigastric vessels, 4, running up behind the divided rectus muscle, 5. The lower part of the tendon of the external oblique is seen at 6, forming Poupart's ligament, just above which, at the external ring, 7, it is penetrated by the cord, 8.

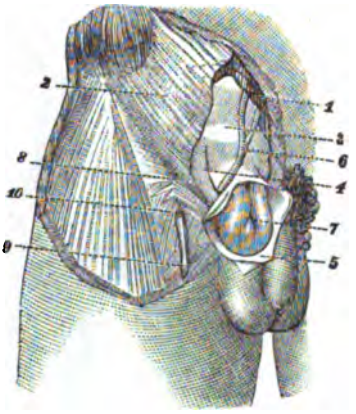
In oblique hernia, the pressure of the tumor widens the external ring, forcing its columns farther away from one another and enlarging it; and the inguinal canal itself is distended, the swelling causing the tendon of the external oblique to bulge.

In Fig. 379, is represented a direct inguinal hernia. All the tissues overlying the sac have been dissected away, and two points must be especially noted. (1) One is that the inguinal canal, 4, lies at the outer and back part of the hernial tumor, instead of being bulged out by the passage of the latter through it; its contents are simply the constituents of the cord. (2)

The other is that the epigastric artery, 6, runs up *back* of the inguinal canal and at the outer side of the neck of the hernial sac. It is perfectly obvious that in this case the relation of the artery to the hernial sac is very different from what it would be if the sac were contained, as in the oblique variety, within the canal.

The sac, 5, is widely laid open so as to show the contained intestine, 7.

Fig. 879.



Direct Hernia—Epigastric artery outside.

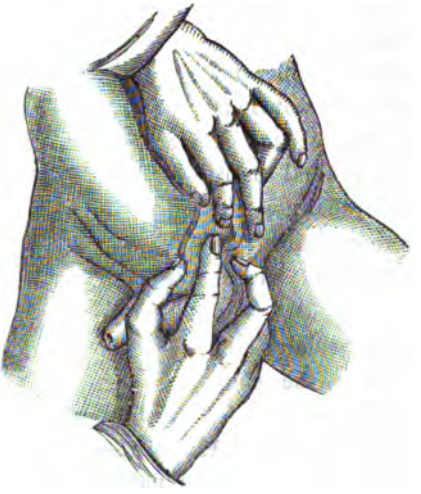
Operations for Inguinal Hernia.—*Taxis*, or reduction. This is very generally done by the patient himself, whenever he is about to apply his truss. It is always attempted by the surgeon before resorting to any other operative procedure for the relief of strangulation; and consists simply in emptying the sac by gently pressing its contents back into the abdominal cavity.

Entire relaxation of the parts must be obtained, the shoulders and hips being raised so as to flex the body forward, and the knees brought up so as to relax the anterior muscles of the thighs. (Formerly, it was advised to employ bleeding, tartar emetic, the warm bath, and enemata of infusion of tobacco to do away with all tension; but these are needless since we have the far more efficient and agreeable means of anæsthesia by ether or chloroform.)

The surgeon now makes with one hand gentle and steady compression of the sack just at its neck, while with the other he exercises a proportionate force, also gently and steadily, upon the whole tumor. The success of this manœuvre is announced by a yielding, with a slight gurgling noise, and a more or less gradual softening, diminution and disappearance of the tumor.

The position of the hands in this operation is shown in Fig. 880. Generally, it is more convenient to apply the left hand to the neck of the sack, while the right pushes the bowel up; but they may often be reversed, at least by a dexterous manipulator, without material disadvantage.

Fig. 880.



Employment of Taxis showing the use of both hands.

The surgeon must use his judgment as to how long the taxis should be persevered with; he should carefully avoid rough handling of the parts, and make his pressure as uniform as possible. When the experiment has been duly made, and has failed, and especially if there is vomiting of fecal matter, he must proceed at once to the last resource.

Postural Treatment.—A plan which is said to have succeeded in some cases of strangulation, when the ordinary taxis has failed, is to have the patient's position reversed; his knees being flexed over the shoulders of a strong man, who then stands up, the patient's shoulders remaining on the bed; the weight of the intestines will tend to drag the protruded portion back into the abdominal cavity.

Herniotomy, or division of the stricturing tissue. As a general rule, the seat of stricture is at or near the neck of the sac. The patient being in a state of anæsthesia, and the parts relaxed as for the taxis, an incision is made in the skin, and the subjacent tissues are successively pinched up, nicked, and divided upon a grooved director, until the sac is reached. This is laid open, and explored with the finger passed up to the seat of stricture; the intestine or omentum is drawn out a little to see what

its condition is; a probe-pointed bistoury or a hernia knife is next cautiously introduced alongside of the finger, Fig. 381, with its back to the bowel, until it is felt to be engaged against the stricturing tissue, against which the edge of the knife is pressed with a slight sawing motion, so as to divide it about one-sixteenth or one-eighth of an inch. This cut must be made directly upward, in order to avoid the epigastric artery, which comes off from the external iliac close to Poupart's ligament, and runs upward and inward. (If the hernia is clearly made out to be direct, which is very rarely the case, the incision may be somewhat upward and inward. In all cases of doubt, it should be upward.) The incision may be repeated at two or three points, if necessary; a single deep cut should never be made, lest the neighboring parts should be injured.

Fig. 381.

Division of stricture, the edge of the bistoury covered with tape.

As soon as the stricture is completely relieved, the protruded parts are cleansed of blood, and examined to determine their condition, whether sound, congested, inflamed, or gangrenous if not gangrenous, they are allowed to slip back into the abdominal cavity; the wound is carefully sutured, a dressing of *Staphysagria* or *Hypericum* applied, the knees tied together, and the patient placed in bed in a relaxed position,—the shoulders raised, the thighs flexed on the abdomen, and a pillow under the knees.

A few doses of *Arnica* may be given to overcome shock and relieve subsequent inflammatory action.

If the protruded intestine is gangrenous, it should not be returned, but an artificial anus should be allowed to form, in the hope that recovery may take place, and the condition be relieved by subsequent treatment. If the mortified protrusion consists of omentum, it should be ligatured tightly, and cut off.

By some surgeons, it is strongly advised that the stricture should be sought for before laying open the sac, and that, if it be found and divided, the sac should be returned unopened, with its contents. To do this with safety, however, it should first be

ascertained that there is no stricture intrinsic to the sac, which, in such case, could be emptied by a procedure like the ordinary one of taxis. Otherwise, the protruded viscera may be pushed back into the abdomen, with the actual strangulation unrelieved.

In a recent case of strangulated hernia exhibited by M. Demarquay, at a meeting of the Academy of Medicine at Paris, the operation was attempted of puncturing the strangulated loop of the intestine and removing the liquid and gas contained therein. The patient had been the subject of a congenital inguinal hernia, and after suffering much fatigue with severe abdominal pains and vomiting, he became aware of the presence of a considerable sized tumor in the left grain. The pain and vomiting continuing, a physician was summoned who advised the patient's removal to a hospital. After considerable unsuccessful manipulation on the part of the *interne*, application of ice was ordered, but it only increased the aggravation; Demarquay attempted reduction by taxis but failed, and then decided to remove the liquid and gas contained in the intestine; a small trocar was therefore introduced into the center of the tumor and the liquid contents of the strangulated portion of the gut entirely drawn off. The swelling at once entirely subsided. The trocar was then withdrawn and the swelling not returning, a slight amount of pressure was applied to the tumor which at once caused the strangulated intestine to withdraw into the abdominal cavity. The patient was confined in bed for several days and made an excellent recovery without exhibiting any other unpleasant symptoms, save the inflammation of one testicle which had been injured by the repeated manipulations to which it had been subjected. Several other instances are recorded in which puncturing the intestine to effect reduction by taxis, have been attended with favorable results and is worthy of practice in those cases where sufficient time has not elapsed to allow of mortification.

Since the published result of the case of M. Demarquay, two other cases of strangulated hernia have been successfully treated by the same process of puncture of the intestine and reported by Dr. Chauveau of Courtelain.

In a case of this description the author performed the like operation of puncturing the gut when taxis had failed to reduce

the tumor, but failed in effecting a cure owing to previous inflammation and the formation of fibrous bands closing the internal aperture so tightly as not to permit the strangulated mass to be returned. In another case the author unable to effect reduction of a strangulated hernia by the ordinary means of taxis, forcibly ruptured the stricture by pushing the index finger through the narrowed orifice and withdrawing it returned the strangulated mass into the abdomen. No bad result followed this novel procedure and the patient made an excellent recovery.

After the operation of herniotomy has been successfully performed, and the wound healed, it is always necessary for the patient to wear a well-fitted truss for some time, if not permanently.

Operation for the radical cure of Hernia.—It would be beyond the province of the present work to discuss the various operations which have been devised for this purpose. Suffice it to say, that the principle is to carry up a doubling or pouch of the subcutaneous tissue along the canal by which the protrusion has occurred, and to fix it there until it becomes firmly adherent, so as to form a plug.

The cases especially suited for this operation are those of persons between puberty and middle age, who would be debarred from active pursuits in great measure, even with well-fitted trusses. In more advanced age the chance of success is not so good, and the object, if gained, of less importance. Hernia in children will often get well without any operation at all, by the mere pressure of the truss.

The following operation, for the radical cure of hernia has proved very successful as practiced by the best surgeons in this country.

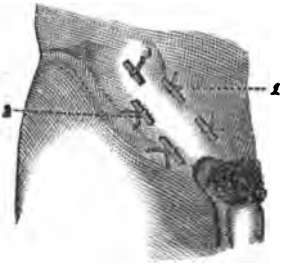
The patient being etherized, the parts are shaved, and an incision about two inches in length made from above downward along the scrotum, beginning just below the root of the penis. This incision involves only the skin and superficial fascia, which are dissected off from the dartos on either side, so that the latter can be invaginated by itself. The finger is now applied to the dartos, a pouch of which is pushed up well into the inguinal canal, but in such a way as to put no stress upon the tissues. Next, the

surgeon substitutes for his finger the closed blades of an instrument such as is represented in Fig. 382 A. This is pushed up as far as possible, and the blades opened. Along one of its grooves a needle having a fine iron wire passed through the eye near its point, is now passed, made to emerge through the skin, and withdrawn, leaving one end of the wire. Being again passed through the other groove, it is made to emerge at a point about half an inch from the first, and again withdrawn, leaving the other end of the wire, which is now tightened, so as to fix the upper cul-de-sac of the pouch in the canal. Two double silk sutures are now passed across, between the blades of the guide, and tied over bits of catheter or rolls of lint. The wire suture is twisted over a similar pad, and the guide withdrawn, when the parts will have the appearance shown in Fig. 383.

Fig. 382 A.

Agnew's instrument for radical cure of hernia

Fig. 383.



Operation for radical cure of hernia. The sutures in situ.

Fig. 382.

Fig. 382 shows the introduction of the needle, but without the guide. The use of the latter adds very greatly to the ease, safety, and certainty of the operation.

A *Staphysagria* dressing is now applied, and the patient put upon the use of remedies to prevent any action of the bowels for several days. In about ten days the iron wire suture may be removed; two or three days afterward, the upper silk suture, and finally, in two or three days more, the lower. A well made suspensory, and a lightly pressing and well-fitted truss should be worn for several months.

Surgical Anatomy of Femoral Hernia.—In this form of hernia, the protrusion occurs just *beneath* Poupart's ligament, at the inner side of the femoral vessels.

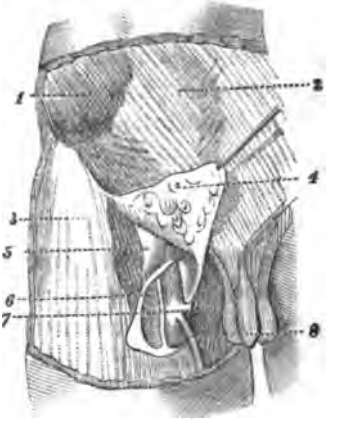
Fig. 384.

Anatomy of pelvis.

Fig. 384 shows the skeleton of the parts concerned. Poupart's ligament stretches from 1, the anterior superior iliac spine, to 2, the symphysis pubis; at 3, the triangular process of it, known as Gimbernat's ligament, is seen; a fibrous septum, 4, extending from it to the brim of the pelvis, divides 5, the space for the passage of muscles, from 6, that for the femoral vessels. It is at the inner side of 6, between the vessels and Gimbernat's ligament, that hernia occurs.

The skin and superficial fascia having been dissected off, the so-called cribriform fascia is seen. This is a sheet of wide-meshed areolar tissue, containing a number of lymphatic glands, as well as small vessels; it begins at the fold of the groin above, and is lost on the front of the thigh below.

Fig. 385.



Position of Femoral Hernia.

Fig. 385 shows the cribriform fascia dissected off and turned upward, so as to exhibit the falciform edge of the fascia lata of the thigh. Below this are the vessels, the artery 6 outside, the vein 7 inside; at 7 the saphena vein empties into the femoral, 8.

The relation of femoral to inguinal hernia is well displayed here; the former below Poupart's ligament, the latter above it, in the inguinal canal, following the course of the chord.

Operations for Femoral Hernia.—The *taxis*. This must be done on the same general principles as in the case of the inguinal form. But as the constricting parts are firmer and more resisting, the danger of strangulation is more imminent, and the attempt at reduction must be less persistent. It must also be

remembered that, especially in cases of long standing, the hernial protrusion turns up over the anterior surface of the fascia lata, and the actual neck of the sac is more deeply seated, and higher up than it would appear to be.

The postural treatment (see p. 638) may be employed here also.

Herniotomy.—The best incision for the relief of strangulated crural hernia consists in dividing the skin first along the fold of the groin, or about half an inch below Poupart's ligament, and from the middle of this cut dropping another, as nearly as possible corresponding with the inner edge of the sheath of the vessels; if the pulsation of the artery can be felt, about half an inch to its inner side.

Two flaps of skin and superficial fascia can thus be turned aside, and the subjacent layers of tissue successively pinched up, nicked, and divided on a grooved director. The sac being reached and opened, the finger is passed up until the stricture is reached, when a probe-pointed bistoury or hernia knife is slipped along the finger and made to nick it. Almost always, the seat of stricture is at Gimbernat's ligament, see Fig. 384; and the edge of the knife should be turned *inward* against it. (If the division were made upward, both the epigastric artery and Poupart's ligament would be endangered.)

The examination of the protruded structures, and the subsequent treatment, are the same as in the case of inguinal hernia.

Operation for Radical Cure.—This is both more difficult and less satisfactory than in cases of the inguinal variety. If attempted, the same general rules are to be followed as before laid down; there will be differences of detail, so obvious that space need hardly be taken up with them here.

Other forms of hernia,—umbilical, obturator, etc.,—sometimes become strangulated, and demand operation; but cases of the kind are very rare, and when they do occur, must be treated on the same principles as those already discussed. The modifications needful would be such as must naturally suggest themselves to those familiar enough with anatomy to undertake procedures of the kind.

SECTION VII.

COLOTOMY, OR THE FORMATION OF AN ARTIFICIAL ANUS.

This operation sometimes gives great relief in cases of stricture of the rectum; it may also be proper in cases of imperforate anus in new-born children, when the gut cannot be entered from the perineum.

Surgical Anatomy.—The course of the colon, begins in the right iliac fossa, at the groin, passing upward, becoming transverse, crossing the abdomen just below the stomach, and then descending along the left margin of the cavity, forming the sigmoid flexure in the left iliac fossa, and finally gaining the front of the sacrum to become the rectum.

Operation.—Anæsthesia should always be induced.

The instruments necessary are: scalpels, a grooved director, metallic dilators, forceps, needles and suture wires, or harelip pins.

There are two points, either of which may be selected for the formation of the opening: the right groin, the ascending colon being entered near its commencement (Littre's operation), or the left lumbar region, the aperture being made in the descending colon (Amussat's).

When an obstruction occurs at or below the sigmoid flexure, there is great distension of the gut by accumulation of feces; and this renders the recognition of it much easier than it otherwise would be.

If the bowel is to be opened in either groin, an incision should be made beginning close to the anterior superior spine of the ilium, and extending parallel with Poupart's ligament for two and a half or three inches. The tendon of the external oblique muscle being exposed, is cautiously opened, and divided on a grooved director. The deeper layers are also divided in the same way, until the gut is exposed; all bleeding being arrested as it occurs.

A ligature is passed through the wall of the colon, so as to keep it under control until it is secured to the edges of the wound, as in the operation of gastrotomy. Immediately upon an open-

ing being made into it, a gush of feces takes place, and the relief given is apparent as soon as the anæsthesia passes off.

The wound is lightly covered with *Staphysagria* dressings, and proper means taken to guard against the soiling of the patient and his bedding by the discharges.

When the bowel is to be opened in the left loin, the patient is laid upon his belly, and the part to be operated on made prominent by a pillow beneath it. An incision is then carried from the outer edge of the erector spinæ muscle, midway between the last rib and the crest of the ilium, outward for three to five inches. The muscles are divided carefully, the wound being held open by assistants, until the gut is exposed, when it is dealt with as in the former case. Two loops of thread are passed through the walls of the bowel, so as to steady it while it is fixed to the edges of the wound and laid open.

SECTION VIII.

OPERATIONS ON THE SCROTUM AND PENIS.

Ligation of the spermatic artery has sometimes been practiced in order to bring about atrophy of tumors of the testis. It is readily done as follows:

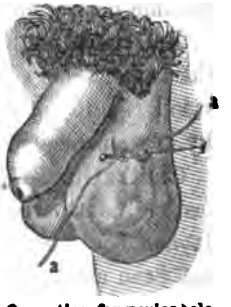
Operation.—The part being shaved, the patient is etherized and laid on his back; the surgeon stands at his right side, and making the skin tense over the course of the cord with the fingers and thumb of his left hand, divides the skin and superficial fascia to the extent of an inch and a half or two inches. Next he pinches up, nicks, and lays open the cremaster and the spermatic fascia, until the constituents of the cord are brought to view, when he isolates the artery and any small branches it may have, ties them all firmly at two points, say half an inch apart, and divides them between the two ligatures.

(The reason for putting a double ligature on is that it is necessary to guard against hemorrhage from the distal end of the vessel.)

Varicocele, or dilation of the spermatic veins, is sometimes treated successfully by producing closure of those vessels. This may be done in various ways.

Operation.—Fig. 386 shows a very simple method. The parts being shaved, the surgeon feels for the spermatic duct (known by its hard cord-like feel), and keeps it out of the way posteriorly, by pinching up the veins, which form a mass like a bundle of worms, in a fold of the skin in front. He then passes a harelip pin through this fold, behind the veins; and by putting a few figure-of-8 turns of a thread over the ends of the pin, he compresses the veins, with a small portion of skin. In about forty-eight hours the pin may be withdrawn, and the loops of thread left to fall off.

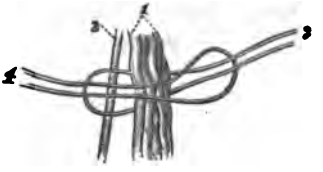
Fig. 386.



Operation for varicocele.

Another method is to include the veins subcutaneously between two loops of thread or wire. A double ligature is passed, as the pin was in the last described plan, *behind* the veins. The skin alone being pinched up, another double ligature is passed, through the same orifices of entry and exit, but in the contrary direction, in *front* of the veins. The ends of each one are now passed through the loop of the other (Fig. 387), and drawn out firmly, when the veins will be compressed between the loops, which will gradually cut their way through. The compression is maintained by tying the ends at either orifice around a bit of catheter or a small roll of lint; they may be tightened every twenty-four hours.

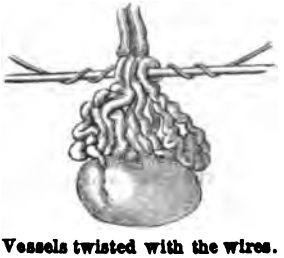
Fig. 387.



The method of Vidal (de Cassis) consists in passing two silver wires, one, the thicker, behind the veins, the other in front of them. They pass through the same orifices of entry and exit, as in the last case, and include as nearly as possible nothing but the veins.

Upon twisting the wires on one another, an effect on the veins will be produced as in Fig. 388; that is, the veins will be rolled up around the stronger of the two wires, and of

Fig. 388.



Vessels twisted with the wires.

course occluded. But little difficulty will be met with, in the course of forty-eight hours or so, in drawing out, first the thicker wire and then the other one—and by that time the veins will probably have become permanently closed.

Breschet's method, by means of two pair of blades to grasp the veins, some skin being also involved, may be readily understood. I do not know that it is at present used or recommended by any surgical writer.

Castration.—The operation of castration, or removal of the testicle, is usually rendered necessary by tumors of that organ. It has been recommended for the cure of epilepsy, but the idea has been most justly abandoned.

Operation.—As this procedure is extremely painful, anæsthesia is always induced. The parts are shaved, and the patient is laid on his back, close to the edge of the table, his lower limbs either raised in the lithotomy position or supported on two chairs. The surgeon stands or sits directly in front, and grasps the affected part with his left hand, so as to steady it and render the skin tense anteriorly. He now makes either one incision, if the tumor be not adherent to the skin, or if it be, two elliptical incisions so as to include all the superficial disease; this section should extend from a point close to the external abdominal ring to the lower part of the scrotum, and should divide the skin and superficial fascia. These should now be dissected away so as to expose the affected organ. Fig. 389. By carrying the dissection deeply enough above, the constituents of the cord may be laid bare, and the vessels secured either by ligation or by acupressure. Next, the cord being divided, the testicle may be dissected away from its posterior attachments. All the diseased tissues should be removed;

Fig. 389.

The process of castration.

but care should be taken not to injure the sound gland or its envelopes. Every vessel which springs should be secured, and the wound closed with sutures. If, as sometimes happens, pus forms in the cavity of the scrotum, it must be allowed to escape by an opening at the lower part of the wound, and prevented from accumulating by very gentle pressure.

Epithelioma of the Scrotum is chiefly observed in chimney-sweepers, whence it has been called *chimney-sweeper's* or *soot cancer;* it appears to be produced by the irritation caused by the contact of soot, beginning as a scaly or incrusted wart which soon ulcerates, and perhaps ultimately involving the whole scrotum, the testis, and the inguinal and pelvic lymphatic glands. The *treatment* consists in complete excision of the growth, at as early a period as possible.

Encysted Hydrocele (*Spermatocele*).—In this affection the fluid is not contained, properly speaking, in the tunica vaginalis, but in an independent cyst projecting from the surface of the testicle, or more commonly from the epididymis. In the latter case, the fluid of the cyst differs from that of an ordinary hydrocele in being watery or milky, and in containing spermatozoa; and the name *spermatocele* is therefore properly applied to these, which belong to the class of *seminal cysts*. Those comparatively rare specimens of encysted hydrocele, however, in which the cyst projects from the body of the testis, cannot be so classed, as they do not appear to contain spermatozoa—their fluid being of a serous character like that of the common hydrocele. The *diagnosis* of the encysted, from the other forms of hydrocele, can usually be made by observing the position of the testis in relation to the sac, which, in the encysted variety of the disease, commonly projects from the surface of, but does not surround the gland. The *treatment* is the same as for the ordinary acquired hydrocele.

Fibrous or Fibro-cartilaginous bodies are sometimes found in the sac of a hydrocele; they resemble in structure the rice-like bodies found in synovial bursæ, and, if recognized during life, may be removed by a simple incision.

Hydrocele of the Spermatic Cord.—Three varieties are described by systematic writers, viz: 1, the *simple* hydrocele of

the cord, which consists in an accumulation of serous fluid in the cavity which often persists in the funicular portion of the vaginal process of the peritoneum; 2, the *encysted* hydrocele of the cord, in which the fluid is contained in an independent cyst developed in this situation; and 3, the *diffused* hydrocele of the cord, a rare affection, referred to by Pott and Scarpa, which appears to consist in an œdematous infiltration of the areolar tissue of the part. The *treatment* of the simple and encysted varieties, consists in tapping, followed, if necessary, by the injection of iodine, or the formation of a seton. For the diffused hydrocele—if any treatment were required—the external use of *Iodine* or other sorbefacients might be resorted to.

Hæmatocele.—Of this there are three varieties, viz.: 1, *hæmatocele of the tunica vaginalis*, consisting in an effusion of blood into this sac, and often supervening upon an ordinary hydrocele; 2, *encysted hæmatocele*, in which the blood is effused into the sac of an encysted hydrocele; and 3, *hæmatocele of the cord*, in which the effusion occupies a position corresponding to that of a hydrocele of this part. Hæmatocele may result from *traumatic* causes—such as a blow or squeeze, or possibly the wound of a small vessel inflicted in the operation for hydrocele—or may originate *spontaneously* from the rupture of a spermatic vein. In the spontaneous cases, which are comparatively rare, the hæmatocele sometimes attains a very large size, and the affection is, under these circumstances, attended with considerable danger. The blood of a hæmatocele is at first of course fluid, and may continue in this state for many years; in other cases, it undergoes partial coagulation, the clots sometimes assuming a laminated arrangement like that seen in the sac of an aneurism; or the blood corpuscles may become disintegrated, when the fluid of the hæmatocele has a dark and grumous appearance, and often contains cholestearine; if decomposition of the blood occurs, suppuration of the sac may ensue, and perhaps lead to fatal consequences.

The *symptoms* are much the same as those of hydrocele, except that the part is not translucent when examined by transmitted light. The *diagnosis*, in the early stages of the affection, can commonly be made by observing that the swelling

occurs rapidly, and usually after a blow—and yet is obviously not due to orchitis—while the absence of translucency, and the existence of ecchymosis, serve to distinguish the affection from hydrocele. When hæmatocele has passed into a chronic condition, the diagnosis is more difficult, and in many cases the disease has been mistaken for cancer, and *vice versa*. Humphry points out that the cancerous testis steadily increases in size, while the growth of a hæmatocele is irregular, and the swelling sometimes even undergoes diminution. The diagnosis from hernia is thus described.

Hydrocele of the tunica vaginalis, *hæmatocele*, *varicocele*, and *tumors of the testis*, are to be distinguished from scrotal hernia by the following *differential diagnosis*.

Hydrocele is to be distinguished by its translucency, its tense and semi-elastic character, its irreducibility, and the absence of impulse on coughing; it begins at the *bottom* of the scrotum, instead of at the *top*, as is the case with hernia, and is distinctly circumscribed, the cord being readily perceptible above it. If a hydrocele of the cord coexist, the diagnosis is more difficult. *Congenital hydrocele*, in which the communication between the tunica vaginalis and peritoneum persists, though reducible by pressure, may be distinguished by the absence of gurgling, and by the gradual manner in which the tumor reappears when the pressure is removed. *Hernia and hydrocele may coexist*, in which case the hydrocele is usually in front, and each tumor presents its own characteristic peculiarities.

Hæmatocele may be distinguished by its history (of traumatic origin), its irreducibility, the absence of impulse and gurgling, and the distinctness with which the cord may be felt above.

Varicocele may be distinguished from hernia by making the patient lie down and by elevating the scrotum, when the tumor, if a vericocele, will disappear slowly and without gurgling; if now the surgeon press *gently* on the external abominal ring, and direct the patient to rise, the tumor, if a varicocele, will be slowly reproduced, beginning at the bottom of the scrotum, but if a hernia, will not reappear; if, on the other hand, *moderately firm* pressure be made upon the cord *below* the external ring, so as to take off the weight of the superincumbent column of blood,

and thus prevent distension of the spermatic veins, the tumor, if a varicocele, will *not* be reproduced, whereas a hernia will slip down alongside of the finger.

Tumors of the Testis may be distinguished by their rounded shape and solid feel, by the absence of impulse or gurgling, by their irreducibility, and by the non-implication of the cord and inguinal canal.

Treatment.—In many cases hæmatocele undergoes a spontaneous cure; the hemorrhage ceases, and absorption then gradually occurs as in the case of blood effused in other parts of the body. Hence, in the early stages of the affection, the treatment should be merely palliative, consisting in the enforcement of rest, with elevation of the scrotum, the application of cold medicated lotions, etc. After a few days, the patient may go about with a suspensory bandage. If, however, the hæmatocele be in a chronic state, tapping may be resorted to, and will occasionally effect a cure; should the sac refill, its contents will probably be thinner and more serous than at first, and the case will thus gradually become assimilated to one of hydrocele, when it may be treated with iodine injections. If the hæmatocele contain a large proportion of coagulum, it will probably be necessary to lay the sac open and allow it to heal by granulation. This should not, however, be done during the early stages of the affection, particularly in a case of the spontaneous variety, lest dangerous or even fatal hemorrhage should take place from the ruptured vein, which is sometimes very much enlarged. Before either puncturing or incising a hæmatocele, the surgeon should, if possible, determine the position of the testis: this cannot be ascertained, as in the case of hydrocele, by examination with transmitted light, but much information may often be gained by tracing down the cord, and by noting the sensations of the patient, who usually experiences a characteristic sickening pain when pressure is made on the testicle.

Congenital Hydrocele results from an imperfect closure of the communication between the tunica vaginalis and the peritoneal cavity. This form of hydrocele is observed in infants, and may be recognized by the fluid flowing back into the abdominal cavity when the scrotum is elevated or compressed. Con-

genital hydrocele usually undergoes a spontaneous cure by the closure of the vaginal process of peritoneum; if, as often happens, the hydrocele be accompanied with hernia, a truss should be worn to prevent the descent of the intestine. Should a congenital hydrocele not disappear spontaneously under the use of appropriate remedies, acupuncture may be tried, or the fluid may be evacuated with an exploring trocar and canula, and a little alcohol injected while compression is maintained upon the inguinal canal. This plan, which is recommended by Richard, is, however, necessarily attended with some risk of peritonitis, which the surgeon must remember before performing the operation and guard against its appearance if possible.

Abscess and Hernia of the Testicle.—*Abscess* is an occasional sequel of orchitis, the pus being usually formed in the tissues of the scrotum rather than in the testicle itself, but sometimes originating beneath the tunica albuginea, in the proper gland structure. In the former case the affection is of but little consequence, the abscess healing without difficulty after the evacuation of its contents; but when the testicle itself is the seat of suppuration, a fistulous opening is apt to remain, through which a portion of the seminiferous tubules may protrude, in the form of a vascular, fungoid mass. The *treatment* of this *Hernia of the Testis*, as it is called, consists in the administration of internal remedies and the topical use of stimulating applications, such as the red oxide of mercury, with pressure—which may be applied with adhesive strips, or, better, as recommended by Syme, by making elliptical incisions around the protruding mass and loosening the surrounding integument, which is then united over the protrusion with sutures—thus making the skin of the part exercise the requisite compression. If one testicle only be affected, and the patient's health begins to fail under the long continuance of the disease, castration may occasionally be justifiable.

Hydrocele.—This affection which consists of an accumulation of serum in the tunica vaginalis, may be treated in two ways: by the mere evacuation of the liquid, or by first doing this, and attempting to prevent its re-accumulation by causing the sides of the sac to adhere to each other. The former is called the palliative, the latter the radical cure.

Operation.—The palliative operation, or tapping, is a very simple one. Anæsthesia can only be needful in very timid persons, and may in them be local.

The patient sits on the very edge of a bed or chair, his knees wide apart. Sitting upon a lower seat directly in front of him, the surgeon grasps the distended scrotum with his left hand, so as to make the skin tense, and with his right pushes the point of the trocar and canula (the cover to protect the point of the trocar when not in use), into the cavity of the tunica vaginalis. In doing this the instrument is held quite firmly at right angles to the skin, and the forefinger applied so as to limit the depth of the insertion. As soon as the point is felt to be free within the cavity, the handle is depressed so as to change the direction of the instrument, in order that the testicle may not be wounded. Upon the withdrawal of the trocar, the liquid flows freely through the canula. Having emptied the sac, the surgeon withdraws the canula, and closes the little wound with a bit of plaster.

If the operation is intended to accomplish a radical cure of the disease, the surgeon, after withdrawing the liquid from the cavity, injects through the canula a small quantity of tincture of *Iodine*. This is done by means of a gum-elastic bag, with a tube fitting into the canula. He then grasps and gently manipulates the scrotum on the affected side, in such a way as to bring the liquid in contact with the whole of serous membrane.

It is necessary to use some judgment as to the amount of exercise the patient may be allowed to take for the two or three succeeding days—so as to induce a sufficient but not an excessive degree of inflammation in the sac.

An amount of swelling generally ensues, nearly or quite equal to that before the operation; under proper treatment this subsides, and adhesion occurs between the opposed serous surfaces.

In children, the mere drawing off of the liquid is very often followed by a permanent cure.

Section of the Frænum.—It sometimes happens that the frænum is so short as to drag down the glans penis, and produce, in erection, a state somewhat resembling chordee. This may be either a congenital defect, or the result of cicatrisation of an ulcer. In either case it may be remedied by putting the part on the

stretch, transfixing it with a straight bistoury, held with the flat of the blade toward the glans, and cutting forward so as to shave away the bridle.

Anæsthesia is hardly necessary in so trifling an operation; nor need the surgeon have any assistants.

Amputation of the Penis may be rendered necessary by cancerous or epitheliomatous disease of the organ.

Operation.—This is very painful, and anæsthesia should be induced. The patient should lie with his hips at the edge of an operating table, his knees wide apart, and his feet supported on chairs. The surgeon draws the skin lightly forward, grasps the penis with his left hand, and with a bistoury in his right, slices it off; he then applies ice-water to the cut surface, and takes up all the bleeding vessels with a ligature.

The most important errors to be avoided in this operation are, 1st, leaving too much skin, which will hang in folds about the stump, and 2nd, allowing the urethral orifice to contract in healing. Only careful judgment can guide the surgeon in regard to the first of these. In order to avoid the second, several plans have been proposed. *Ricord's* is to slit up the urethra about a quarter of an inch, in four places—then turning the flaps so formed outward, to stitch them to the skin. *Teale* cuts the urethra across very obliquely, so as to make a long flap of its floor, which he turns back and stitches to the skin. *Miller* proposes a more complicated method, bringing the urethra and corpus spongiosum out through a button-hole cut in an inferior flap an inch and half long, which flap is brought up to cover the cut end of the corpora cavernosa.

Hypertrophy or Elephantiasis of the Scrotum is chiefly seen in warm climates. The disease anatomically resembles what has been described as the *fibro-cellular outgrowth*, and can only be removed by excision. When of moderate dimensions, the hypertrophied scrotum can be removed with little risk; but when, as not unfrequently happens, the part forms a pendulous tumor weighing from forty to eighty pounds, the operation becomes one of a formidable nature. To diminish the loss of blood, which is always considerable, the tumor should be elevated above the rest of the body for some hours before the operation, the blood

squeezed out, and the neck of the tumor compressed with a clamp, as recommended by Fayrer, or with a running noose, as ingeniously suggested by Dr. Mactier. If a *hernia* be present, this should first be fully reduced.

Operation.—The operation may be performed by introducing a director down to the penis, which lies at the bottom of a sinous, deeply buried in the mass, and upon the director a catlin, which is made to transfix the superincumbent tissues and cut its way outward. The penis is now carefully dissected out and held up toward the abdomen, when incisions are made on each side so as to expose the testes, which are similarly dissected out and turned up until the operation is completed. The tunicæ vaginales, if diseased, are to be cut away, and then the whole mass separated by cutting across its base close to the perineum. Hemorrhage is next to be suppressed, the vessels tied, and the wound dressed with *Calendula cerate* and allowed to heal by granulation. The testes and penis become quickly covered, and cicatrization is usually completed in from six weeks to two months. If, in the case of a very large tumor, it is found that the dissection of the testes would prolong the operation beyond from three to five minutes, Fayrer advises that the attempt to save these organs should be abandoned, and the whole mass swept away as quickly as possible. Of twenty-eight patients operated on by Fayrer, twenty-two recovered and six died, one from shock, and the other five from pyæmia.

SECTION IX.

MALFORMATIONS OF THE URETHRA.

The urethra may be *partially* or *completely occluded*, or may be partially *deficient*, an abnormal opening existing on its upper or lower surface. When the opening is above, the deformity is called *epispadias*, and when below, *hypospadias*.

Partial Occlusion, or *Congenital Narrowing of the Urethra*, occurs at or near the external meatus; the treatment consists in restoring the calibre of the part by an incision with a probe-pointed bistoury, recontraction being prevented by the subsequent use of a bougie.

Complete Occlusion of the urethra produces retention of urine which usually proves fatal within a few hours of birth; if the condition should be recognized during life, the occluding membrane, which is usually but a few lines in thickness, should be divided with a sharp bistoury or punctured with a trocar and canula, the opening being maintained by the occasional passage of a bougie. Should the point of occlusion be so far back as to render it impossible to reach it from the meatus, it would, I think, be the surgeon's duty to open the urethra behind the seat of obstruction, if this could be done from the perineum, or to puncture the bladder by one of the operations which have already been described.

Epispadias, or *Deficiency in the Roof of the Urethra*, may be complete or partial. *Complete epispadias* is seldom met with except in connection with *extrophy* of the bladder; the latter deformity having been remedied in the way to be described, the epispadias may be relieved by a plastic operation. *Partial epispadias* is but a lesser degree of the same deformity, the abnormal opening extending from near the pubes to the end of the penis; it may be treated in a similar manner, by turning down a narrow flap from the hypogastric region, and covering it in with a bridge of skin dissected from the scrotum. This operation, which originated with Nelaton in 1852, has been since repeated, both by himself, by Follin, and by J. Wood, with good results.

Hypospadias, or *Deficiency in the Floor of the Urethra*, is a common affection. The abnormal opening, which is usually much smaller than that of epispadias, is commonly found at the base of the frænum, more rarely at the point of junction of the penis and scrotum, and occasionally, it is said, in the perineum. Complete hypospadias, associated with cleft scrotum, constitutes one form of hermaphrodism, so called. When the opening is placed far back, the deformity, beside causing inconvenience in micturition, interferes with the ejaculation of semen, and thus renders the patient practically sterile; under these circumstances the malformation (which is usually unimportant) may call for surgical treatment, which consists in endeavoring to restore with knife or trocar the natural passage from the meatus to the urethra above the hypospadiac orifice.

Urethral Fistula.—Fistulous communications between the male urethra and the external surface of the body are not unfrequently met with in cases of long-standing stricture. There may be one or several external openings, and these may be situated in the perineum, scrotum, or lower surface of the penis, or even in the thighs, buttocks, or abdominal wall.

Operation.—The *treatment* must be first directed to the cure of the stricture, for the abnormal openings cannot be expected to heal while any obstruction to the natural course of the urine remains. Simple dilation will in many cases be sufficient, and it often happens that when the normal calibre of the urethra has been restored, the fistula will heal of itself. If the stricture is very hard and cartilaginous, or peculiarly irritable, or if, though easily dilated, it constantly tends to recontract, it will usually be advisable to resort at once to external division (Syme's method), which promises better results under these circumstances than either rupture or internal urethrotomy. If the stricture be impermeable, the perineal section must be performed as a last resort. If the fistula still persists after the cure of the stricture, special means must be adopted for its treatment. It is often recommended to retain a catheter in the bladder, in these cases, so as to prevent any urine from escaping through the fistula; but the plan very seldom succeeds, for the reason that a small quantity of urine invariably trickles alongside of the instrument, and thus defeats the object in view. It is much better to teach the patient to use a gum-elastic catheter for himself, when, if he can be induced to co-operate with the surgeon by not under any circumstances, urinating except through the instrument, the fistula will probably heal without difficulty under simple dressing. The *special treatment* of urethral fistulæ varies according as they are seated in the perineal, scrotal or penile portion of the urethra.

Perineal Fistula.—If of small size, a perineal fistula may be induced to heal by introducing a fine probe coated with nitrate of silver, or (which is probably the most efficient means) by the application of the galvanic cautery. If there be several external openings, a good plan is to connect them together, with an oakum thread, introduced by means of an eyed probe; while, if this fail, it may be necessary to lay open the smaller sinuses by incision

upon a grooved director. If the fistula be a large one, its edges may be touched with strong nitric acid, so as to make a superficial slough, which, when detached, will leave healthy granulating surfaces; or the edges may be deeply pared, and brought together with metallic sutures.

Scrotal Fistula, on account of the lax condition of the parts, usually requires to be freely laid open, when it will probably heal by granulation; or the edges may be deeply pared and the adjacent tissues dissected up, so as to form broad and thick flaps, which are then to be accurately brought together in the median line with deep and superficial sutures.

Penile Fistula is the most intractable form of urethral fistula, and can seldom be cured without a plastic operation. In some cases, however, success may be obtained by touching the edges with nitric acid, and holding the granulating surfaces together with *serre-fines*, after the detachment of the slough. The contact of urine must be prevented by keeping a full-sized catheter in the bladder, or, which is usually better, by the frequent introduction of a flexible instrument. *Dieffenbach's lace suture* may also be applied with advantage in some cases. The edges of the fistula are first blistered with the tincture of cantharides, and the cuticle scraped off with a scalpel. By repeated introductions of a small curved needle, a waxed silk thread is next carried subcutaneously around, but not across, the fistula, at a distance of about a quarter of an inch from its margin, when, by drawing upon both ends of the thread, the opening is puckered up like the mouth a purse, and secured with a knot. The suture may be removed after three or four days.

Blind Urinary Fistula is the name given to suppurating tracks opening into the urethra, but having no external orifice. The *treatment* consists in laying open the sinus, and then proceeding as in the cure of an ordinary urethral fistula.

Urethroplasty.—The simple urethroplastic operations occasionally required in cases of perineal and scrotal fistula, have just been mentioned. More complicated procedures, are, however, often needed in the treatment of fistulæ in the penile portion of the urethra.

A good plan is to freshen the edges of the fistula and dissect

up long, bridge-like flaps, which are then stitched together over a slip of India-rubber, or, which is better, a piece of thin lead ribbon so as to prevent the contact of urine. This operation is said to have originated with Dieffenbach.

LeGros Clark pares the edges of the fistula, and closes it by dissecting up flaps from each side, and joining them in the middle line by means of the clamp or quill suture. Whichever plan be adopted, it is best to divert the course of the urine for a few days, by opening the urethra in the perineum.

The other operations on the penis and urethra, including the introduction of instruments for stricture, external section of urethra, cauterization, and the various means of forcible and gradual dilation of that canal, with the consequences that ensue from chronic disease of the urethra, are fully treated of in Vol. 1, page 420, entitled Strictures of the Urethra.

CHAPTER VI.

URINARY CALCULUS.

SECTION I.

VARIETIES.

In the urine are found deposits of various solid substances, which when in the form of an impalpable powder are called *sediments*, when granular or crystalline are spoken of as *gravel*, and when concreted into masses constitute *calculi* or *stones*. The constitutional conditions which precede or accompany the formation of these deposits are often called *diatheses*, and surgeons thus speak of the *uric acid*, the *oxalic*, and the *phosphatic diathesis*.

Varieties of Calculus.—The most common and therefore the most important varieties of calculus are those composed respec-

tively of uric acid, oxalate of lime, and phosphatic salts. Beside these, other varieties are occasionally met with, in which the concretion is composed of urates, cystine, xanthine, fatty matter, carbonate of lime, etc.

Uric Acid Calculus.—This is very common, constituting, according to Roberts, five-sixths of all renal calculi, and of vesical calculi which have recently descended from the kidney. When uric (or lithic) acid is deposited as *gravel*, it occurs in the form of little crystalline masses or flattened concretions of a yellowish or reddish-brown color. Fig. 390. The uric acid calculus is ordinarily of moderate size, of a flattened oval form,

Fig. 390.

Uric acid.

Fig. 391.

Uric acid calculus.

and of a fawn color: on section, it is often found to be composed of concentric laminæ. Fig. 391. Its weight rarely exceeds an ounce. The surface of the stone is usually smooth and somewhat mamillated, but occasionally rough and manifestly crystalline. The best test for uric acid is the development of a bright violet or purple hue (*murexid*), on applying the vapor of ammonia to the residue left by treating the suspected substance with nitric acid and heat. The urine of patients with uric acid calculus, is acid and frequently high-colored; it often deposits uric acid crystals and amorphus urates. This form of stone is met with among free livers, especially those of a gouty habit, and among strumous, over-fed children.

Urates.—The urates of potassa, soda, and ammonia are not unfrequently deposited in the form of an amorphous sediment in urine *after it has been voided*, constituting the common *lateri-*

tious deposit which is met with in febrile affections, or which may occur from mere concentration of the urinary secretion; but *calculi* composed of urates are very rare. They are almost exclusively observed in young children, and as *renal* concretions; though it is probable that urates occasionally form the *nucleus* of a *vesical* stone. The exact chemical composition of these calculi is a matter of some doubt, most authorities regarding them as concretions of *urate of ammonia*, though one of the latest writers, Roberts, of Manchester, appears to regard them as consisting of *urate of soda*. Urate calculi are soft, and never large; they may be recognized by their solubility in hot water. *Urate of ammonia* is often deposited in connection with *phosphates* from ammoniacal urine, and is thus met with in the outer layers of vesical calculi.

Oxalate of Lime Calculus (*Mulberry Calculus*).—When evacuated in the form of gravel, oxalate of lime occurs as minute seed-like concretions, of a smooth and rounded form, and of a grayish-brown color. The oxalate of lime calculus is hard, of a somewhat spherical shape, dark brown or black (more rarely bluish-gray) in color, and tuberculated on the surface, somewhat resembling a mulberry. It rarely attains a lare size. Oxalate of lime and uric acid are often deposited in alternate layers, the calculus consisting of more or less perfect concentric laminæ; the nucleus of such a calculus is usually composed of uric acid. Oxalate of lime is soluble in nitric and hydrochloric acids, and when treated with the blowpipe leaves a residue of lime, which blues reddened litmus, and browns turmeric. The deposit of oxalate of lime appears to be due to an imperfect metamorphosis of the azotized constituents of the blood, originating sometimes in errors of diet, or in exposure to bad hygienic conditions of various kinds.

Phosphatic Calculus.—Of this there are three varieties:—*Amorphous Phosphate of Lime* (*bone earth*) is rarely met with as the sole constituent of a calculus. Stones of this variety are of a whitish, chalky, or pale-brown color, are smooth and friable, and sometimes attain a considerable size. The phosphate of lime calculus may be recognized by its solubility in nitric and hydrochloric acids, and by its being totally infusible

before the blowpipe. Phosphate of lime is also met with in the urine in a *crystalline* form (*stellar phosphate*), but does not under these circumstances occur as a calculus. The presence of amorphous phosphate of lime in the urine depends solely on the alkaline condition of that secretion.

Phosphate of Ammonia and Magnesia (*Triple Phosphate*).—This is more common than the phosphate of lime; the stones are of a whitish-gray color, and evidently composed of crystals. The triple phosphate is soluble in acetic, or in hydrochloric acid, and is precipitated by an excess of ammonia, in a crystalline form. It is with difficulty fusible before the blowpipe.

Mixed or Fusible Calculus.—This variety is formed of a mixture of the phosphate of lime and triple phosphate. The mixed phosphates rarely constitute the whole of a calculus, but, on the other hand, very frequently form some of the outer layers, deposited upon uric acid or other nuclei, or upon foreign bodies. The triple phosphate and mixed phosphates are met with in alkaline, and especially in ammoniacal urine.

Cystine Calculus.—This is a rare form of calculus. It is of a yellow color and has usually an oval shape, and a mamillated and slightly lustrous surface. On section it presents a radiated appearance, and is at first of a yellow, wax-like color, turning to a pale green by long exposure to the light. Cystine is soluble in the mineral acids, and in ammonia; when precipitated from a solution in the latter (by evaporation of the solvent), it appears in the form of characteristic six-sided crystals.

For further information with regard to the various forms of urinary deposit and urinary culculus, the student is referred to special works on the diseases of the urinary organs, and particularly to the writings of Bird, Jones, Beale, and Roberts.

Renal Calculus.—Renal calculi are, in the large majority of instances, composed of uric acid. The symptoms produced by a renal calculus consist of pain of an aching character in the lumbar region, with occasional aggravation (*nephritic colic*) in which the pain shoots downward toward the scrotum and inner part of the thigh, and is attended by nausea or vomiting, and by dysuria and increased frequency of micturition. The urine at such times may contain blood, pus, or epithelial scales. When a

calculus escapes from the kidney into the ureter, giving rise to a *fit of the stone,* the symptoms are greatly aggravated. The patient is suddenly seized with intense pain, radiating down the inside of the thigh and into the spermatic cord and testicle, the latter organ being retracted. There is constant vomiting, with a feeling of great prostration, constipation, partial suppression of urine, and, if the attack continues, decided febrile disturbance.

The symptoms quickly subside when the calculus reaches the bladder, but if, as sometimes happens, the concretion becomes impacted in the ureter, dilatation of that tube will ensue, with consequent disease of the corresponding kidney. Should impaction occur on both sides, a fatal result will be inevitable.

Vesical Calculus.—A vesical calculus may, as has been seen, originate from a concretion which has descended from the kidney; but in other cases stone is primarily formed in the bladder, by the aggregation of small granular particles, around which, as a nucleus, fresh deposits subsequently take place, or by the deposit of calculous matter around some extraneous substance, such as a bullet, pin, straw, or broken catheter, which has been introduced from without.

SECTION II.

STRUCTURE AND PHYSICAL CHARACTERS OF VESICAL CALCULI.

Structure.—Calculi may be composed throughout of the same substance, but in many instances consist of several layers or laminæ of different chemical characters, deposited around a central portion or *nucleus.* These stones are called *alternating* calculi. The nucleus is usually composed of uric acid, oxalate of lime nuclei coming next in frequency. When the nucleus is phosphatic, the stone is not alternating, the layers subsequently deposited being phosphatic likewise. Whatever be the primary nature of the calculus, it may become encrusted with phosphates in consequence of an ammoniacal state of the urine, due to vesical irritation. Calculous matter may be deposited around a mass composed of several small concretions aggregated together, the stone then appearing on section to contain several nuclei.

Number.—In the majority of instances the bladder contains but

a single calculus, but occasionally two or more are found in the same case, and in a few instances very large numbers of stones co-exist; the most remarkable case on record is, perhaps, that of Chief-Justice Marshall, from whose bladder Dr. Physick is said, on the authority of Dr. Randolph, to have removed by lithotomy more than one thousand calculi. Sometimes several calculi become glued together by sabulous matter and inspissated mucus, forming one large stone somewhat resembling a grape-shot in miniature.

Shape.—The most common shape of a vesical calculus is a flattened ovoid, though mulberry calculi are often somewhat rectangular, or irregularly rounded, while phosphatic stones are occasionally curiously branched or constricted. When several calculi are present, the opposing surfaces become worn by attrition, various facets being thus developed on the sides which are in contact.

Size.—The size of calculi varies from that of a pin's head to that of a mass several inches in diameter. One of the largest stones known was extracted by a Belgian surgeon named Uytterhoeven, by the suprapubic method, the concretion in this instance being six and a half inches long and four wide, and weighing over two pounds. Such large stones are, however, seldom seen at the present day, and one or two inches may be considered an average length of the calculi ordinarily met with in practice.

Weight.—The weight of vesical calculi varies as much as their size. The lightest stones mentioned in Crosse's tables weighed three and four grains respectively, and the heaviest, seven and eight ounces; but even this weight has been greatly exceeded by that of stones seen by Mayo, Harmer, Cooper, Mott, Cline, Morand,* and other surgeons. The average weight is from one or two drachms to an ounce. Of seven hundred and four calculi referred to in Crosse's tables, there were three hundred and forty in which the weight was under, and three hundred and sixty-four in which it was over, three drachms.

Hardness.—The hardness varies according to the chemical nature of the calculus—stones of the mulberry variety being the

* Morand is said to have seen a vesical calculus weighing six pounds.

least, and those of the phosphatic the most easily broken. Some of the latter variety are extremely friable, and of a mortar-like consistency.

Situation.—The situation of calculi in the bladder varies with the amount of urine contained in the organ, the size of the stone, and the position of the patient. The locality in which a stone is usually found upon sounding, is, at least in the case of small calculi, at the *bas-fond* of the bladder; but a stone may at other times rest directly upon the neck of the viscus, or may be lodged above the pubes, or behind the prostate—the latter being, indeed, the usual locality in cases of chronic prostatic enlargement. A calculus usually floats loosely in the bladder, but may be fixed in one of the pouches of the organ (if this be sacculated), when the stone is said to be *encysted;* it may also be *adherent* to the side of the bladder, or may be caught in the orifice of a ureter, or may be partially surrounded by a fungous growth. In other cases calculous matter, instead of being concreted into the form of a stone, is deposited in ridges or layers upon the vesical mucous membrane.

Causes of Calculus.—The causes of calculus are in most cases very obscure, for though it is often possible to trace the occurrence of urinary deposits to certain definite states of the constitution, there is no apparent reason why these deposits should form calculous concretions in some cases and not in others. Occasionally, however, the development of calculus is evidently due to the presence of a foreign body, as a broken catheter, slate-pencil, or hair-pin.

Age.—Age appears to exercise a decided influence upon the occurrence of calculus, the statistics collected showing that, in round numbers, about two-thirds of the whole number of cases are in persons under twenty, and about two-fifths in those under ten years of age.

Sex.—Persons of the male sex are undoubtedly more apt to be affected with vesical calculus than women; but the difference is probably not greater than can be accounted for by the respective anatomical peculiarities of the male and female urethra, the escape of small calculi through the latter being much easier than through the former.

Residence.—The frequency of calculous disorders varies in different localities; thus, in our own country, stone is, according to Gross, more common in the States of Kentucky, Virginia, Tennessee, and Ohio, than in any other regions. In the neighborhood of Philadelphia it is certainly very rare; the records of the Pennsylvania Hospital showing that of about eighty thousand patients treated in its wards, in one hundred and sixteen years, there were but one hundred and twenty-five cases of stone, a proportion of less than one-sixth of one per cent.

Other Causes.—Among other circumstances which have been supposed to influence the frequency of the occurrence of calculus, may be mentioned *race*, *climate*, *diet*, *the use of limestone water*, *social condition*, *hereditary predisposition*, etc.

Finally, any circumstance which, by interfering with the excretion of urine, leads to vesical irritation, and, in consequence, to an ammoniacal state of the contents of the bladder, may be considered as predisposing to the production of stone; thus *stricture of the urethra*, *enlargement of the prostate*, and paralysis of the bladder from *injuries of the spine*, may all act as causes of vesical calculus.

Symptoms of Vesical Calculus.—These vary according to the shape and size of the stone, the age and general condition of the patient, etc. A smooth and rounded calculus produces less irritation than one which is sharp and angular, and a small stone usually causes less disturbance than a large one. In children, though there be a good deal of local distress, there is seldom much constitutional suffering, the patients often appearing particularly rosy and hearty. This is not, however, invariably the case, and children are occasionally seen who are much emaciated and worn down by the constant irritation produced by the stone. In adults, the general health suffers at a comparatively early period, and inflammation of the bladder and kidney are common complications of stone at this period of life. Phosphatic calculi are usually said to produce more irritation than those of other varieties, the fact being that cystitis (with an ammoniacal condition of the urine) almost invariably precedes and accompanies the deposit of phosphatic matter.

Pain is usually a prominent symptom of stone, and often the

first which attracts attention; beside a dull pain and feeling of weight in the region of the bladder and in the perineum, there is pain referred to the groins, testes, thighs, or even the arms or soles of the feet, with a peculiar, sharp, cutting pain in the glans penis, which is most marked in children—leading to a habit of squeezing and dragging at the part, and giving rise to elongation and hypertrophy of the prepuce. The pain is usually worst immediately after urinating, from the stone then falling forward on the neck of the bladder, which is the most sensitive part of that organ. In order to prevent this, calculous patients get the habit of making water in the recumbent position. The pain is always increased by riding or walking, or by any movement which causes the stone to jolt about in the bladder; these variations in the amount of pain felt, are less marked in those cases in which the stone is habitually lodged behind an enlarged prostate, and are almost absent in cases of encysted calculus.

Frequent and Painful Micturition is a very constant symptom of vesical calculus; in some instances there is absolute incontinence of urine, and in others retention; the flow sometimes stops suddenly from the stone falling over the orifice of the urethra, beginning again when the patient changes his position. The urine often contains blood, and if there be cystitis, may be heavily loaded with mucus or pus; when the kidneys become implicated, the urine is commonly albuminous. The detection of crystals of uric acid or oxalate of lime in the urine serves to distinguish the nature of the calculus.

Prolapse of the Rectum occasionally occurs in children from efforts in passing the urine.

Diagnosis.—From observation of some or all of the symptoms mentioned, the surgeon may *suspect* the existence of a calculus in the bladder, but cannot be certain of it until he has elicited physical evidences of the presence of the stone. In children the calculus may sometimes be felt by the finger introduced into the rectum, and in women by a similar exploration, *per vaginam*, but the common means of determining the presence of a stone is by the introduction of a *sound* into the bladder.

Prognosis.—Stone in the bladder, unless removed by treatment, leads to serious morbid changes in the urinary organs, a

fatal result being, sooner or later, almost inevitable. The prostate commonly becomes enlarged, and cystitis occurs, the bladder usually being contracted and ribbed, but sometimes dilated; congestion and ultimately granular degeneration of the kidneys follow, and the patient dies worn out by suffering, or from the progress of the renal affection. If, on the other hand, the presence of the stone be recognized at an early period, and proper treatment adopted before the viscera, and especially the kidney, have become seriously involved, the prognosis is quite favorable.

Sounding for Stone.—This includes not only the detection of the presence of a calculus, but the appreciation, more or less accurate, of its size, character, and position.

None of the above symptoms must be depended on alone. The existence of the stone must be made sensible to the ear and fingers, and the instrument employed for this purpose is a *sound*, a solid iron rod, plated with nickel, the size of a medium catheter, not large enough to distend the urethra. Its handle should be grooved and flattened, and the surgeon should possess several, of various lengths and curves.

The rational symptoms of stone being made out, the patient is directed to remain at entire rest for at least twelve hours, and to hold his water for about two hours before the sounding is done. The instrument is passed like a catheter, and its short beak drawn backward and forward, and rotated either way, always with the utmost gentleness, until the whole bladder has been explored. Anæsthesia will be necessary if the urethra or bladder be very irritable; sometimes the stone cannot be felt without it. By the feel of the stone its character as to hardness or softness may be judged of. By the length of contact of the sound, some idea of its size may be gained, while its mobility or fixedness may be more or less accurately detected. Sometimes the left forefinger in the rectum gives us valuable information in connection with sounding.

Notwithstanding the advocacy by some authors of sounding with the lithotrite, or with catheter-sounds by which the bladder may be injected, the solid steel instrument will probably never be superseded for the purpose.

There are two methods by which calculi may be removed from the bladder: *lithotomy*, or cutting, and *lithotrity*, or crushing.

With the wide subject of the history of these operations, it is not possible to deal here. As to the choice between them, it may be said that the former is almost always to be preferred in children, and as a general thing in the very old. Lithotrity answers best in cases of adults, where the stone is small and soft, the genito-urinary organs not specially irritable, and the urethra of full calibre.

It is an invariable rule, in all operations for stone, of whatever kind, that the rectum should be empty; but surgeons generally prefer to have some liquid in the bladder. Preparation by treatment and generous diet will add to the chances of success, whenever the disease has existed for a length of time and caused emaciation and debility.

Another valuable precaution is to keep the patient at complete rest for a day or two before he is operated on.

Lithotomy.—There are four methods of cutting for stone: 1, the ordinary *lateral*; 2, the *bilateral*; 3, the *median*; 4, the *suprapubic* or high operation. Whichever of these is chosen, the rule is imperative that the calculus should be felt in the bladder, *at the time*, or the operation postponed.

Surgical Anatomy.—The anus is nearly at the central point of the perineum, when the patient is placed in what is known as "the lithotomy position." An inch and a half or more in front of it is the bulb of the urethra, and just behind this, in the median line, but deeper, is the membranous portion of the canal. The membranous portion, traced backward, ends at the prostate gland, through which the canal runs, this part of it being called the prostatic portion.

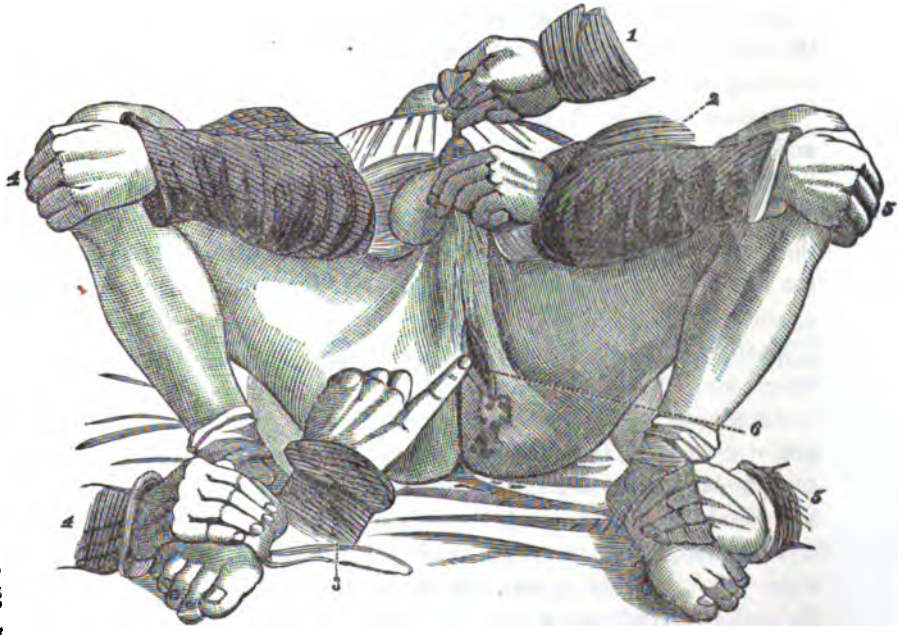
The transverse, perineal muscle runs across from near the tuber ischii to the raphe, a little in front of the edge of the sphincter ani muscle. The superficial perineal, and transverse perineal arteries, lie upon the surface of the transverse muscle. The artery of the bulb arises from the pudic, and runs across and forward to the bulb.

On deeper dissection we find the levator ani muscle, which forms the floor of the pelvis, and is inserted into the sphincter ani and raphe of the perineum, surrounding by its anterior fibres the membranous portion of the urethra.

One layer of the deep perineal fascia runs up to the bulb, another to the anterior edge of the prostate, so that the membranous portion of the urethra lies at the bottom of the space between the two. Cowper's glands lie at either side of this space.

Operation.—Position of the patient. Ether having been administered, the buttocks are brought to the edge of the operating-table, the legs flexed on the thighs, and the thighs on the pelvis. Each foot is then placed in the palm of the corresponding hand, and firmly bound there with turns of a roller. This is called "the lithotomy position." Fig. 392.

Fig. 392.



POSITION FOR LITHOTOMY.—No. 1, assistant's hand guiding or holding the staff; Nos. 2, 4, 4, 5, 5, arms of assistants steadying the legs of the patient; No. 3, left hand of operator feeling for the groove in the staff, the first incision being made; No. 6, the direction of the first incision.

Instruments required. For the sound previously used to detect the stone is now substituted the staff, an instrument with a longer curve than the bougie or catheter, and with a deep and wide groove at its convexity (a little to the right of this), so as to

guide the knife into the bladder. Besides this, a good-sized scalpel or two, one probe-pointed, forceps of various shapes, scoops, and a large syringe for washing out the bladder, are needful.

Variously-shaped knives have been employed and recommended by different surgeons and writers on lithotomy. By some, the same knife is used throughout; by others, the sharp-pointed scalpel is exchanged for a probe-pointed one as soon as the urethra is fairly opened.

The gorget, formerly used for making the section of the prostate, its beak being engaged in the groove of the staff, is now almost, if not altogether, abandoned.

The blades of the forceps generally used are very smooth on the outside, but studded interiorly with points to prevent their slipping when the stone is grasped.

Besides these we should have forceps with the blades curved, and it is well to have them of various lengths and sizes.

Forceps are also made with fenestrated blades, to occupy somewhat less room; but if the stone is rough, the portion exposed through the openings may lacerate the tissues at the margin of the wound in the process of extraction, which should be guarded against by the surgeon.

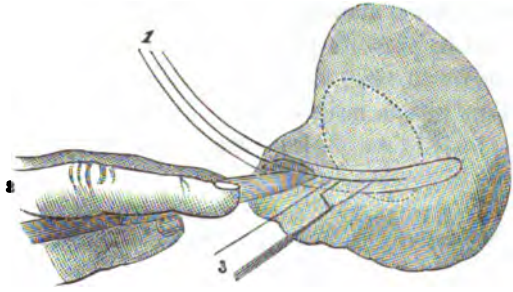
Sponges, tenacula, artery-forceps, ligatures, hot and cold water, etc., should also be at hand.

Assistants. Five at least; one to give the anæsthetic; one at each knee, to hold it well outward; one, the most important, to hold the staff; and one to hand the instruments and tie the vessels.

Everything being ready, and the perineum shaved, if necessary, the surgeon, standing in front of the patient, passes the staff, and feels the stone. The assistant who is to hold the staff, standing on the patient's left, grasps the handle of the instrument, and keeps it exactly as the surgeon directs, either hooked up against the pubis, or bearing prominently forward in the perineum; he at the same time, with his left hand, holds the genitals up and out of the way. Another assistant, standing in front of the last named, holds the left knee outward, while another does the same for the right.

The surgeon now makes his first incision, beginning in the median line, an inch and a half in front of the anus, and cutting downward and outward to a point midway between the anus and the left tuber ischii; this incision divides the skin and superficial fascia only. The fascia and muscular tissues are next cut, toward the staff, deepening the first wound in front. With the knife and left forefinger this process is continued, until the nail can be engaged in the groove of the staff. Now, guiding the same or a probe-pointed knife on the finger, the tip of the knife is engaged in the grove, and pushed on along it, the handle of the knife being depressed (Fig. 393) until the fact of the bladder being entered is announced by a gush of urine. At once the

Fig. 393.



MANNER OF HOLDING KNIFE.—No. 1, the staff engaged within the bladder. No. 2, the finger of the surgeon guiding the knife. No. 3, the handle depressed to enlarge the wound.

knife is withdrawn, and the finger pushed along the staff into the bladder, so as if possible to feel the stone. In doing this, the cut in the prostate gland is dilated, and may be more widely opened by a seesaw movement if the stone is very large. As soon as the finger is fairly in contact with the stone, the staff may be withdrawn; and the surgeon, passing in a pair of lithotomy forceps, closed, tries to grasp the stone between their blades. If he succeeds in so doing, he at once attempts to withdraw it with them, gently rocking them if the stone is too large to come easily through the opening. Sometimes an oval stone is caught with its long axis across the forceps, in which case the grasp must be changed, with the aid of the forefinger.

Occasionally a strong pair of forceps must be introduced, and the stone broken up, so as to be removed piecemeal.

Sometimes a scoop has to be employed, the stone being caught between this and the forefinger.

All the larger portions having been taken away, a stream of tepid water should be driven into the bladder from the syringe, until no more fragments or debris are washed out by it; and then the cavity should be cautiously but thoroughly explored with the finger, to detect any encysted or otherwise engaged calculi.

Hemorrhage, if there is any, should now be arrested by ligating the vessels which bleed. The hands and feet are untied, the knees fastened together with a handkerchief or two or three turns of a roller, and the patient placed in bed.

Should blood continue to ooze, a bit of ice or styptic cotton may be placed for a moment or two in the wound, and if this fails to arrest it, pressure may be made by means of a metallic tube furnished with rings at the end resembling a catheter as is shown in Fig. 394, a mesh of lint being tied around the con-

Fig. 394.

Tube for plugging the wound in lithotomy.

stricted portion, which is passed into the wound, and secured in the bladder by tapes passing from the rings to a waistband. The urine flows freely away through this tube. Very little dressings are required, ordinarily, after this operation. The author is in the habit of applying a pledget of lint to the wound, wet with *Hypericum* lotion, to prevent inflammation and assist in the healing process.

The *bilateral* method. This differs from the procedure just described, in respect only to the line of incision and the method of making it.

Operation.—A semilunar external incision is made through the skin, from a point midway between the right tuber ischii and the anus, curving forward so as to cross the raphe about an inch and a quarter in front of the anus, and terminating at a point opposite to that of its commencement, *i. e.*, midway between the anus and the left tuber ischii.

The tissues are next divided in successive layers, until the staff is felt, when the point of the knife is carried into its groove, so as to make an opening in which the surgeon can enter the beak of the double lithotome cache. The extent to which the blades shall be opened having been previously arranged by means of the small screw just back of the joint, this instrument is now engaged in the groove of the staff, pushed well on into the bladder, opened by pressing on the lever, and withdrawn, cutting its way out through the prostate. A gush of urine follows, and the finger is immediately introduced as in the lateral operation.

The remaining steps are accomplished in the manner before described.

The *median* operation.

Operation.—An incision is made in the median line, from about half an inch above the anus, directly into the groove of the staff, along which a short cut, say half an inch long, is made in the urethral wall, and as the knife is drawn out, the skin is divided upward to the extent of about an inch and a half. A large director, is now introduced along the staff into the bladder, the groove of the director being kept downward like that of the staff, and the staff withdrawn; a probe-pointed knife is then guided in upon the director, the prostatic portion of the canal laid open to a sufficient extent, and the vesical cavity reached with the finger, when the forceps may be introduced and the extraction of the stone accomplished as in either of the before-mentioned methods.

The *high* or *suprapubic* operation has very seldom been done, and the results attained have not been encouraging. It may, however, be the only resource, as for example where the ordinary "lithotomy position" cannot, from rheumatic or other stiffening of one or both hip-joints, be assumed by the patient; or where there has formerly been disease or injury of the perineum, altering the relations of the tissues.

Surgical Anatomy.—When the bladder is much distended, it rises above the pubes, and is separated from the surface only by the skin and superficial fascia, and a variable but not large amount of deeper fibrous tissue; the pouch of peritoneum usually existing in front of the fundus being obliterated.

Operation.—The pubic region being shaved, the patient is laid on his back on the operating-table, his nates close to the edge, and his legs hanging over. An incision is then commenced just over the symphisis, and carried upward in the median line for about three inches; the skin and superficial fascia only being divided. The linea alba is now cautiously opened for an inch or more. A long and strongly curved sound is now introduced through the urethra, and its point pushed, if possible, against the anterior wall of the bladder so as to press it forward into the wound. Cutting down upon this the surgeon enters the bladder with a probe-pointed bistoury, and cautiously divides the anterior wall downward for the space of about an inch, still in the median line. He now introduces the finger, feels the stone, inserts the scoop or forceps, and effects the removal, enlarging the opening if necessary, but never dividing the peritoneum.

Another plan of opening the bladder is by means of a long canula and stylet introduced like the sound above mentioned, and its point pushed through the anterior wall from within.

After the removal of the stone, a gum catheter is placed in the bladder so as to keep it empty, and the wound is closed with care, so as to prevent if possible urinary infiltration or the formation of abscesses.

Comparison of these Operations.—Lithotomy having been decided upon, unless the stone is known to be very large, the lateral method is usually preferable; although for an experienced and confident operator, there is perhaps little to choose between this and the median.

The bilateral method gives a greater amount of space for the withdrawal of the stone, but has no other advantage; while in unskilled hands there is a chance of doing harm by too wide an incision of the prostate.

The danger of peritonitis and infiltration of urine after the high operation is so much greater than after either of the other procedures, that it should only be chosen when the stone is very large, the prostate much hypertrophied, or the "lithotomy position" impossible.

Lithotrity, or Crushing.—This operation, one of the modern improvements in surgery, is applicable to cases of adults,

where the constitution is good, the urinary organs sound, the bladder not specially irritable, the urethra free from stricture, and the calculus single, of moderate size, and not too hard. Sometimes it does well in old people, and sometimes in cases where some of the above-mentioned conditions are wanting; but the general rule is as stated.

For a day or two beforehand, the patient should be kept at rest, and the bladder should, if irritable, be prepared by the daily passage of a good-sized sound for the manipulation it is to undergo.

Generally several successive "sittings," three or four days apart, are required to effect complete relief. Of these, the first may be two or three minutes in length, but not more; the later ones should not exceed three to five minutes. Anæsthesia is only required when the bladder is very sensitive.

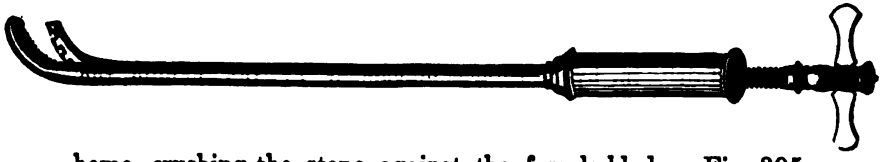
The instruments needful are: steel sounds, catheters, and lithotrites. A syringe of about eight ounces capacity, fitted to the catheters, should be at hand also.

A somewhat short-beaked sound, with a bulbous extremity, is the best; some operators use the lithotrite itself for the purpose, finding and catching the stone at once. Some surgeons prefer a hollow or catheter-like sound, by means of which the bladder may be injected if it is desired, without changing the instrument.

The lithotrite consists of a grooved steel bar, turned up for about an inch at the end, with a steel rod sliding in the groove, and likewise bent.

By far the best arrangement is to have the two blades freely moveable upon one another, but with a catch so that the shaft may be brought into connection with a screw; in this way the stone may be easily sought for, and when once it is grasped, the screw may be brought into action, and the male blade driven

Fig. 395.

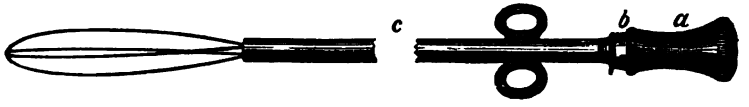


home, crushing the stone against the female blade. Fig. 395. The latter should have a hole at the bend, for the escape of

debris. The screw may be worked directly with the thumb and fingers, or by means of a rack and pinion.

A small lithotrite to break up fragments lodged in the urethra is sometimes useful, or they may be caught by means of the small scoop with a hinge point, or Hodgen's Urethra Snare, Fig. 396, and thus drawn out.

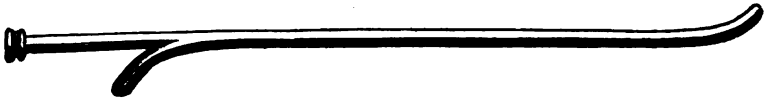
Fig. 396.



A, B, handle of instrument. C, cylinder with the snare projecting.

It is not necessary, although a common practice with some surgeons, to wash out the bladder with tepid water at the close of each sitting. When this is done, a double catheter, Fig. 397, will be found useful.

Fig. 397.

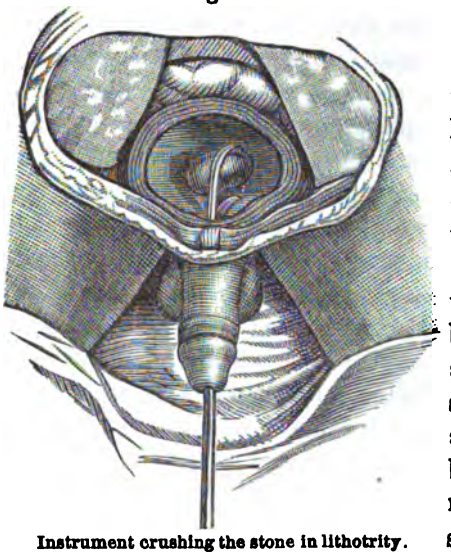


Double Catheter.

Operation:—The patient having retained his water for two or three hours, is laid on his back, on a firm mattress at a suitable height; the surgeon stands on the right side, with his face toward the foot of the bed, and takes the penis between the middle and ring fingers of his left hand, opening the meatus with the thumb and finger. With his right hand he now gently enters the lithotrite, closed and well oiled, into the canal and slips it gradually down, keeping the handle at first over the right iliac spine, then sweeping it around into the median line, and bringing the shaft perpendicular, until the point nears the prostate; the handle is now depressed, to a degree proportioned to the enlargement of the prostate, over which the tip glides into the bladder.

Once fairly in, by a rotary movement of the handle, the beak of the instrument is made to fall over laterally, when, if the stone is touched, the male blade is withdrawn a little, so as to try to grasp the stone between it and the female blade. Fig. 398. If this be accomplished, the instrument is turned back

Fig. 398.



Instrument crushing the stone in lithotrity.

again so as to bring the stone into the middle of the vesical cavity, and the male blade is screwed home. This manœuvre is repeated again and again, until the time for the sitting is exhausted.

If at the first attempt the stone is not felt, the beak may be rotated so as to fall over to the other side of the median line, and if this fail, a gentle backward and forward motion may be made, still with the lateral half-turns, so as to explore thoroughly the bas-fond of the organ.

It must never be forgotten that the male blade is the one to be moved on the female; that the crushing is to be done in the middle of the cavity; and that in effecting it the blades must always be brought into contact. Fragments cannot be safely drawn through the urethra in the grasp of the instrument, although it has several times been done with undeserved success.

The instrument should be very lightly held in searching, very firmly and steadily in crushing.

When symptoms of inflammation of the bladder or testicles arise after an operation of this kind, prompt treatment is necessary. No further attempt at crushing the stone ought to be made until they have been wholly subdued, and then only with great caution.

Stone in the female bladder is of very rare occurrence. When it is met with, if the concretion is of small size, it may often be removed by merely dilating the urethra (by expanding a pair of forceps introduced through it) so as to afford room for its passage or extraction; or an incision may be made upon the straight staff or director, and the forceps passed into the bladder as in the male subject.

After-treatment.—This is sufficiently simple. The bed must be protected with India-rubber cloth, covered with a folded sheet or blanket, to absorb the urine (which of course flows through the wound), the sheet being changed, so as to keep the patient dry and comfortable, and a pledget wet with *Hypericum* lotion applied to the external wound and changed from time to time. For a day or two the urine escapes entirely by the wound, then probably for a few hours by the urethra (owing to the swelling of the deep part of the incision), and then again partly by the wound in gradually decreasing quantities as the healing process continues. No dressing should be applied as long as any water escapes through the perineum, but after this, the incision may be treated as a superficial wound in any other situation. *Aconite* may be administered to relieve inflammation and fever, the diet and general treatment of the patient being adapted to his constitutional condition.

SECTION III.

MALFORMATIONS AND MALPOSITIONS OF THE BLADDER.

In some cases the bladder has been totally absent, the ureters opening directly into the urethra, or into the rectum or vagina, while in other instances two or more bladders are said to have coexisted in the same subject, though, as justly remarked by Thompson, it is probable that in most of these cases the condition has not been congenital, but rather one of extreme sacculation, the result of disease.

Extroversion or Exstrophy of the Bladder is by far the most common congenital defect of this viscus, and is met with sufficiently often to make its treatment a subject of considerable importance. This deformity, which is much commoner in the male than in the female sex, and which appears to be due to an arrest of development during fœtal life, consists in an absence of the anterior wall of the bladder, with a corresponding deficiency of the lower part of the abdominal parietes, and usually of the pubic symphysis. The penis, in the male, is epispadiac and shortened, and the clitoris, in the female, is split into two por-

tions corresponding to the nymphæ, the anterior commissure of the vulva being wanting, and the bladder and urethra thus opening between the labia and directly into and immediately above the vagina; the uterus is commonly well formed, and in a case under the care of Drashurst, the vaginal orifice was normally closed with a hymen. The anus is placed in front of its usual position, and, in the male, the scrotum not unfrequently contains a hernia on one or both sides. The recti abdominis muscles are separated at their lower part, passing obliquely outward to their insertions into the pubic bones, and in many, but by no means in all cases, the separation is continued upward almost to their costal attachments, in which case there is no umbilicus, the interval between the recti being filled with a fibrous tissue analogous to the linea alba.

The *appearances* in a case of exstrophy of the bladder are quite characteristic. The posterior wall of the bladder (covered, of course, with mucous membrane) is pushed forward by the abdominal viscera which are behind it, and forms a prominent but reducible tumor in the situation of the pubes. The mucous surface, which is red, papillated, and vascular, is continuous at its periphery with the abdominal walls, the line of junction having a thin cicatricial appearance. At the lower part of the projecting vesical surface, the ureters can be seen, giving exit to the urine by drops, or sometimes in a stream. The exposed mucous membrane, which is constantly irritated by the contact of the patient's garments, becomes inflamed, and bleeds when touched, while the groins, thighs, and buttocks are excoriated from urine flowing over them.

In addition to the physical distress thus occasioned, the patient has the annoyance of knowing that he is deformed in a part which few are so philosophical as to consider of no importance in their own persons, and is besides rendered, by the continual dribbling of urine, an object of disgust to himself as well as to others. Otherwise the deformity does not particularly interfere with the general health, and is by no means incompatible with a long life. In the female the reproductive function is not impaired, and instances are on record in which women with exstroverted bladders have borne children; but in the male sex the

accompanying deformity of the genital organs is so great as to render procreation impossible.

Treatment.—Until within a few years, this malformation was thought to be beyond the reach of surgical aid, and the utmost that was attempted for patients thus affected, was to supply a mechanical apparatus to shield and protect the exposed bladder from injury, and to convey the urine into a suitable receptacle; but the apparatus was necessarily cumbrous and irksome, and fulfilled its design in, at best, a very unsatisfactory manner. Within a few years, endeavors have been made to remedy, or at least to alleviate, by operative interference, the condition of patients afflicted with exstrophy of the bladder, and in several instances with very gratifying success. The operations which have been devised for the purpose may be divided into two categories, viz., 1, those which aim to divert the course of the renal secretion into another channel, and, 2, those the object of which is merely to cover in the exposed bladder by a plastic operation, and thus render possible the adaptation of a convenient receptacle for the urine. To the first category belong the operations of Simon and Holmes, and to the second, the plastic procedures of Richard, Pancoast, Ayres, Holmes, Wood, Maury, and others.

1. Mr. Simon, of St. Thomas's Hospital, in the case of a boy of thirteen, established by an ingenious procedure, fistulous communications between the ureters and rectum, with the hope that, the flow of urine being diverted, the exposed mucous surface of the bladder would assume the character of skin. The operation was, from the first, only partially successful, and the patient died about a year afterward from disease of the ureters and kidneys, which was apparently set up by the irritation caused by the operation itself. In two other cases, in which similar procedures were undertaken, by Lloyd and Athol Johnstone, the patients died within a few days from acute peritonitis, so that, as justly remarked by Holmes, as far as present experience goes, the danger and difficulty of the operation appear to outweigh its probable advantages. This excellent surgeon has himself suggested a plan of effecting the desired object, by applying in the bladder and rectum the two branches of a pair of screw-forceps (with a plate broad enough to extend from one ureter to the other), which,

acting like Dupuytren's enterotome, should establish the necessary communication between the organs without risk of perforating the peritoneal cavity. This suggestion which seems to be worthy of future attention, has not, as yet, however, been satisfactorily tested in practice.

2. *Plastic operations*, varying more or less in their details, have been employed by several surgeons for the relief of exstroverted bladder, and in most instances with very gratifying results.

Richard, modifying Nelaton's operation for epispadias, operated, in 1858, by dissecting a broad flap from below the umbilicus, turning it with its skin surface toward the bladder, and covering it with a bridge of skin taken from the front of the scrotum. This operation, though most ingeniously planned, unfortunately induced peritonitis, which proved fatal.

To Professor Pancoast belongs the honor of having (in 1858) performed the first successful plastic operation for exstrophy of the bladder. His method consisted in taking flaps from the groins, inverting them over the protruded organ, and attaching them together in the median line, thus leaving a broad granulating surface which slowly cicatrized. The patient recovered from the operation, but died some months later from another affection.

In the same year Dr. Ayres, of Brooklyn, N. Y., operated on a woman (who had previously given birth to a child) by turning down an umbilical flap—as had been done by Richard—covering it in by simply dissecting up the skin of the abdominal walls on either side, and bringing together the tissues thus loosened in the median line. The operation was perfectly successful.

Mr. Holmes, who has operated in five cases, employs two flaps, one from the groin, which is inverted, with its cutaneous surface toward the bladder, and the other taken from the opposite side of the scrotum and slid over to cover in the first. This plan was also followed by J. Wood in some of his earlier cases.

Dr. F. F. Maury, of Philadelphia, has obtained a most gratifying result in two cases, by taking a saddle-shaped flap, attached at both ends, from the scrotum, and inverting it bridge-like over the bladder—leaving the raw surface of the flap to heal by granulation and cicatrization. He succeeded in each case (as did

Pancoast) in effecting the cure of a hernia by the contraction which accompanied the healing process.

Mr. Barker, of Melbourne, has successfully operated in a young girl, by simply dissecting up the integument on either side of the bladder, uniting the flaps thus formed with deep and superficial sutures, and relieving tension by means of lateral incisions.

Prof. Wood, of King's College, London, has operated in eight cases, and has latterly employed a method which is now usually known by his name, and which has been resorted to with gratifying success. Three flaps are used, one taken from the umbilical region and inverted over the bladder, as in Richard's and Ayres's methods, and the others, one from each groin, united in the median line over the first, which they cover in. The great advantage of the inverted umbilical flap, is that it effectually prevents the escape of urine in an upward direction, while the groin flaps cover in the raw surface of the other without undue tension, and, having broad bases, are in no danger of sloughing. In the case of a male subject, Mr. Wood forms a roof for the urethra, at a subsequent operation, by inverting flaps from the newly-formed covering of the bladder, and from the sides of the penis, adjusting over them a bridge-like flap from the scrotum, as in Nelaton's and Richard's procedures.

By this operation the patient is placed in a very comfortable condition; incontinence of urine, to a certain extent, necessarily continues, requiring the patient to wear a "railway urinal," or some similar contrivance, but the bladder is effectually protected from irritation, and excoriation is readily prevented. The principal points requiring attention in the after-treatment, are to prevent tension on the flaps and encourage the contraction of the granulating surfaces by the position of the patient, who should be placed in an almost sitting posture, with the knees flexed over pillows. In an adult, trouble may be caused by the growth of pudendal hairs, if the reversed flaps embrace any portion of skin naturally thus covered, and it will then be necessary, from time to time, to practice evulsion with suitable forceps, until the inverted surface shall have lost its cutaneous character and become assimilated in nature to mucous membrane. Injections of dilute *acetic* or *nitric acid* may also be required, to relieve vesical catarrh and prevent the deposit of phosphates.

Malpositions.—Under this head may be included two affections, one of which, *Hernia of the bladder* or *Cystocele*, has already been referred to, the other being *Inversion of the bladder*, which is extremely rare, and exclusively met with in female children.

Inversion of the bladder consists in a protrusion or invagination of the bladder through the urethra, where it appears in the form of a red vascular tumor; this, in one of the few cases of the affection on record, was mistaken for a new growth, and preparations had been actually made to remove it by ligation, when the discovery of the orifice of a ureter fortunately prevented the consummation of the operation. The protruding organ is readily reduced by manual pressure, but re-descends when the pressure is removed, and incontinence of urine necessarily remains. To remedy this, Dr. John Lowe, of Lynn, made repeated applications of the actual cautery to the urethra, keeping the bladder in place by means of a catheter with a bulbous extremity; he thus induced sufficient contraction to prevent any protrusion whatever, and to diminish, though not entirely to remove, the incontinence.

CHAPTER VII.

OPERATIONS ON THE ANUS.

SECTION I.

HEMORRHOIDS.

Hemorrhoids or *piles*, are tumors met with at or within the verge of the anus, consisting essentially of a hypertrophy and infiltration of the mucous or muco-cutaneous and subjacent areolar tissues, with a varicose dilatation of branches of the hemorrhoidal veins; in some instances rupture of a vein occurs, with extravasation of blood into the subcutaneous tissues, while

in other cases there appears to be a new development of arterial capillaries, the pile being then of a vascular, spongy, and almost erectile character, and its mucous covering having an ulcerated, granular, or somewhat villous appearance.

Piles are classified according to their situation, into *external* and *internal*, and according to the presence or absence of hemorrhage, into *open* or *bleeding*, and *blind* piles. The ordinary *bleeding pile* is that form of internal hemorrhoid in which the arterial element predominates, and is sometimes called from its shape the *globular* pile, in contradistinction to the *longitudinal* or *fleshy* pile, which is rarely attended by hemorrhage.

Causes of Hemorrhoids.—Any circumstance which impedes the returning current from the hemorrhoidal plexus of veins, or which encourages a flow of blood to the rectum, tends to promote the formation of piles; hence a sedentary life, luxurious habits, occupations which require much standing (as that of a barber), disorders of the alimentary canal, or of the liver, the presence of abdominal tumors, the pregnant state, constipation, the straining due to urethral stricture or prostatic enlargement, inordinate sexual indulgence, etc., may all act as causes of hemorrhoids. Piles may occur at any age, but are most common during the periods of adolescence and later adult life. They occur with about equal frequency in either sex. The first step in the formation of a pile, either external or internal, is dilatation of a hemorrhoidal vein, soon followed, if the disease persists, by hypertrophy and infiltration of the superincumbent tissues; when the pile is unirritated or *indolent*, it may appear to consist merely of a fold of skin or mucous membrane and areolar tissue, but when from any cause the hemorrhoid is *inflamed*, it becomes swollen and tense, and is evidently filled with fluid or coagulated blood. After a succession of such attacks, the pile forms a distinct tumor, sometimes of considerable size, which, even in its indolent state, gives a good deal of annoyance by its bulk and the sensation of weight which it occasions.

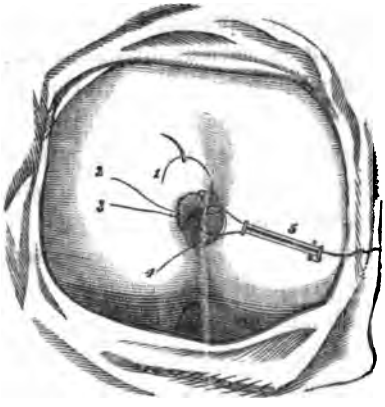
External Piles.—In the *indolent* state these appear as small tumors or radiating folds, occupying the verge of the anus external to the sphincter, and covered with the thin integument of the part. They give rise to a feeling of heat and fullness

about the anus, particularly after defecation, and may be attended with some itching, but do not usually cause a great deal of inconvenience. When *inflamed*, however, they become excessively painful, the pain radiating in various directions and being much aggravated by exercise, or even by the assumption of the erect posture; they are often accompanied by an intolerable itching and burning, with violent tenesmus, depriving the patient of sleep, and for the time being rendering life almost a burden. If examined in this condition—which constitutes an "attack of the piles,"—the hemorrhoidal tumors will be found tense and swollen, extending up within the grasp of the sphincter, and thus becoming partially covered with mucous membrane (*extero-internal* piles). Their color, which in the uninflamed state was nearly that of the surrounding integument, is now of a deep purplish-red hue. The hemorrhoidal tumor occasionally suppurates, but more commonly returns gradually to its previous indolent state, becoming, however, larger and more indurated with each successive attack of inflammation. When piles are large and numerous, the skin between them may undergo maceration, giving rise to a sero-purulent discharge which sometimes produces troublesome excoriation. External piles are rarely attended by bleeding, but Syme and others have recorded cases of profuse rectal hemorrhage, in which no internal piles could be found, and in which entire relief was afforded by the removal of pendulous flaps of skin which surrounded the anus. The *diagnosis* of external piles is made with little difficulty; the only affections with which they are liable to be confounded are *vegetations* and *mucous patches*, but these can be distinguished by observing that they are not, like piles, solely confined to the anal region. External hemorrhoids often coexist with the painful ulcer of the anus, or with fistula in ano.

Internal Piles.—These are situated entirely within the sphincter, and therefore covered with mucous membrane. As already mentioned, there are two principal varieties, the *longitudinal* or *fleshy* pile, which in structure corresponds pretty closely with the external hemorrhoid, except that the venous element is more prominent, and the *globular*, *vascular*, or *granular* pile, which is characterized by the development of a congeries of arterial

capillaries. The former variety has a broad base, is firm and elastic to the touch, and of a reddish-brown color; the latter may be either sessile or pedunculated, is at first of a bluish hue (resembling a varicose vein), but ultimately assumes its characteristic red color, and villous or strawberry-like appearance. Internal piles may exist just within the sphincter, or an inch or two higher up; occasionally the hemorrhoidal tumors form a double circle, one above the other. The symptoms of internal piles are similar to those of external hemorrhoids, but there is more distress, from the tumors frequently protruding during defecation and being caught or grasped by the sphincter, thus causing great pain and tenesmus. The frequent protrusion of the piles ultimately leads to general prolapse of the mucous coat of the rectum, while the constant irritation of the part gives rise to a discharge of thin mucus, which excoriates the skin around the anus, and is often sufficiently abundant to soil the patient's clothes.

Fig. 398.



Protruding hemorrhoids. Ligatures 1, 2, 3, 4, passed through the base of the pile tumor; 5, canula in position for strangulation.

Bleeding from the Rectum, or the *Hemorrhoidal Flux*, is a most characteristic symptom of internal piles; it may accompany either form of the disease, though by far most common in connection with that in which there are isolated tumors with a granular, strawberry-like surface. In most instances, blood of an arterial hue appears to issue directly from the surface of the pile, but occasionally there is a general oozing from the congested mucous membrane, or a copious stream may be poured from an ulcerated opening in a dilated vein. The amount of blood varies, in different cases, from a few drops to many ounces —enough in some instances to produce excessive and even fatal anæmia and exhaustion. The bleeding may be continuous, or intermittent—recurring sometimes at regular intervals. The

occurrence of the hemorrhoidal flux is not unfrequently preceded for some days by an increase of the ordinary symptoms of piles, constituting what the older writers called the *Hemorrhoidal Effort*: in these cases, the loss of blood seems often to act beneficially both by giving local relief and by acting as a derivative, and perhaps preventing serious visceral congestions. The hemorrhoidal flux sometimes alternates vicariously with the menstrual flow. The pain in a severe case of internal piles is not limited to the rectum, but radiates to the loins, sacrum, hips, and thighs, and marked sympathetic irritation is frequently developed in the urino-genital organs. Internal, like external piles, may become inflamed, and ultimately subside into an indolent condition, persisting as hard and incompressible tumors containing clotted blood; the clot occasionaly undergoes a calcareous change and becomes converted into a *phlebolite* or *vein stone*. In other instances, the piles protrude and are strangulated by the sphincter, eventually sloughing off, and thus undergoing a spontaneous cure.

Internal hemorrhoids are to be *diagnosticated* from prolapsus; and from polypus of the rectum: in complete prolapse of the rectum (a very rare affection), the smooth character of the mucous membrane and the cylindrical form of the protrusion will enable the surgeon to make the diagnosis, while the common form of prolapse, in which the mucous membrane alone is implicated, may usually be distinguished from piles by its annular form, and by the absence of distinct tumors. The two affections, however, often coexist in the same patient. Rectal polypus may be recognised by its being solitary and of comparatively large size. The *diagnosis of bleeding piles* from other sources of intestinal hemorrhage may be made by observing that the blood in the hemorrhoidal flux is bright, liquid and spread over, rather than mingled with, the feces, whereas blood entering the bowel at a higher point will be dark, partially clotted, and mingled more or less intimately with the other contents of the intestinal canal. Internal hemorrhoids sometimes exist in cases of fistula in ano, and may prove a troublesome complication in the treatment of that affection, by protruding in the wound after the operation.

Excision.—Anæsthesia should always be induced; if it is contra-indicated, the operation can hardly be necessary. Care should be taken not to cut away too much tissue, since this would involve a most troublesome narrowing of the anal orifice. The patient should lie on his left side, his left thigh and leg stretched out, his right drawn up into strong flexion, and his hips close to the edge of the bed or table. An assistant should draw up the right buttock so as to more fully expose the parts.

Hemorrhoids, or piles when entirely external to the sphincter ani, may be clipped away with scissors, or shaved off with a knife, the tumors being in either case drawn out with a pair of broad-bladed ring forceps, or by means of a ligature passed through them.

Should bleeding occur, it may be checked by ligating or twisting the bleeding vessel, by the application of styptics, by a stream of cold water from a syringe, or by pressure with dry lint.

Internal Piles should never be excised, since death has resulted from uncontrollable bleeding after such operations, even in the hands of the ablest surgeons. Strangulation, by ligature or by the wire and double canula, as shown in Fig. 398, is safer, and is always successful if thoroughly done. Other methods, such as the application of strong nitric acid, nitrate of silver, or even the actual cautery, have been used, but are not more reliable. Nitric acid may be applied, as advised by Mr. Henry Smith, of London, by first enclosing the base of the pile closely with a metallic shield to protect the neighboring surface; or the same object may be attained by smearing the surface around the pile with olive oil, or any other unctuous substance. The ecraseur has found advocates, but is only a prompter means than the ligature; the mode of its application is to surround the pile-tumors with the chain, the tumors having been first encircled at their base with a ligature, so as to make a well-defined groove for the chain.

Operation of ligation.—The patient is first made to strain down while sitting over a vessel of steaming-hot water, so as to cause the tumors to protrude as completely as possible. He is then to be etherized, and as soon as the first insensibility is

induced, a silk ligature is to be passed, by means of a needle, through the base of the hemorrhoid; if the margin of the anus is fringed with the piles, a thread should be carried from within outward through the base of the principal one on each side. The long ends of each thread are knotted together and left hanging.

Full anæsthesia is now induced, and the patient laid in the same position as for the excision of external piles. The surgeon draws down the tumors by means of the ligatures, and if they have narrow pedicles, proceeds at once to cast a strong thread around them, close to their bases; including as much as he can in each loop. But if the piles have a large surface of attachment, it is better to push a strong needle through their bases, at right angles to the threads, and then, dividing the loops, to tie the corresponding ends as tightly as possible together, beneath the ends of the needle, which prevents the threads from slipping up so as to embrace too little of the tumors. Sometimes it is well to take a fresh thread and cast it around the whole mass, so as to ensure the strangulation. When the tumor becomes blue and cold, the needle may be withdrawn, and the parts left to slough away. Pain is to be allayed, if there is any, by *Hypericum* lotion, by suppositories containing opium, or by the hypodermic injection of morphia.

When the wire and canula is chosen, the essentials of the operation are the same; the wire loop is adjusted around the base of the tumor, its ends passed through the barrels of the canula, drawn as tightly as possible, and fastened each to the ring or button on the side of the instrument.

In Fig. 898, the ligature is seen passed through the mass of hemorrhoids on the left side of the anus, 1, 2, 3, 4, the wire loop and canula, 5, ready for adjustment over those on the right side.

When the piles are partly internal and partly external, the margin being covered on one side with skin and on the other with mucous membrane, the skin should be completely divided by touches with a knife, before the strangulation is made; otherwise the compression of the cutaneous nerves will give rise to very intense and long-continued pain. One mode of doing this

is to have the buttock drawn upward by an assistant, while the tumor is drawn downward by means of a needle thrust through its base, so that the skin is put on the stretch, and the surgeon has a fair chance for its complete division. The wire loop may then be adjusted, so that it can be tightened as soon as the parts are prepared for it.

The apparatus devised many years ago by Dr. George Bushe, for passing the ligature around hemorrhoidal tumors, is still in use, and often answers better than any other. It consists of a needle, curved, and with an eye near the point. This is threaded, and pushed through the base of the pile from above downward, by means of the needle carrier, the tip of the needle being caught and pulled through with the forceps. In order to get at the tumor with greater facility, it is grasped and drawn downward with the forceps, which are either toothed, or furnished with expanded and fenestrated ends. A pair of scissors, curved on the flat, to be used to snip off external piles, are generally put in the cases as sold.

Before performing any operation for hemorrhoids, the surgeon should see that the patient's bowels are thoroughly evacuated and aided if necessary by an enema; and after the operation is completed, the entire rest of the parts should be secured by *Hypericum* lotions applied by means of linen pledgets, and by a concentrated diet, so as to prevent the formation of fecal matter as much as possible. If fever should arise it must be controlled by *Aconite*. A certain degree of difficulty of micturition, amounting sometimes to actual strangury, is apt to occur for the first two or three days after the strangulation of piles; but the use of hot fomentations to the hypogastric region, and the internal administration of *Cantharides*, will usually allay this symptom.

These operations, when successful, give great relief, and are generally considered to be free from danger. Within a little more than a year, three cases have been reported in which fatal tetanus ensued upon the operation by ligature; one occurred to Dr. Packard in private practice, one in his wards at the Episcopal Hospital, and one in the service of one of his colleagues in that institution.

SECTION II.

PROLAPSUS ANI.

Prolapsus of the rectum sometimes demands special operative interference, although it is generally met with as a secondary symptom, as for example in cases of piles, or stone in the bladder.

The operation does not differ materially from that for external hemorrhoids; the great object being to remove, symmetrically, the exact amount of tissue which is superfluous. Ether having been administered, the patient is placed on his side, his limbs drawn well up, and the parts exposed. The surgeon now, with forceps, pinches up in succession several radiating folds of the mass of prolapsed substance, and snips them away with curved scissors. Any arteries that spring are to be promptly secured by ligature, and dressings applied as in hemorrhoids. The contraction of the cicatrices will narrow the orifice so as to prevent the descent of the bowel.

When the prolapsus is very extensive, a large ring of mucous membrane and skin coming down, or being permanently protruded, the entire mass may be removed, either by surrounding it with the ecraseur, or by cutting away first one half and then the other.

Unless care and judgment are used, so much tissue may be taken away as to produce an excessive narrowing of the anal orifice; a condition not only very distressing, but very difficult to remedy.

Excision of a V-*shaped segment* of the sphincter on one or both sides has been occasionally practiced, but is a severe mode of treatment, and may be followed by fecal incontinence.

Finally, in cases in which operative interference is not deemed advisable, great comfort may be afforded by the adaptation of a well-fitting anal truss or supporter.

Inflammation of the Rectal Pouches.—The pouches or lacunæ of the rectum are sometimes much enlarged, chiefly in old people, becoming distended with fecal matter, and as a consequence inflamed or ulcerated, and causing intense itching, and

often severe pain, unaccompanied, however, by spasm of the sphincter. This affection was first described by Physick, under the name of *Encysted Rectum*, and is called by Gross, *Sacciform disease of the Anus*. The *diagnosis* is readily made by exploring the rectum with a blunt hook or a probe bent at its end. The *treatment* consists in drawing down successively each pouch that is affected, and excising the mucous fold at its base with curved scissors.

SECTION III.

FISSURE OF THE ANUS.

This most painful affection, consisting in a more or less narrow ulceration of the mucous membrane, which is stretched open at every dilatation of the anus by fecal matter, may be relieved in two ways.

Operation.—By *section*. The patient is laid on the left side, the right leg and thigh well flexed. By means of a bivalve anal speculum, the fissure is brought into full view, and scored with a bistoury in its whole length. One cut is generally sufficient, if it is deep enough to involve about one-half the thickness of the sphincter muscle. The bowels should be confined by means of appropriate remedies for four or five days, after which the rectum should be emptied by an emollient enema,—such as flaxseed tea, or thin oatmeal gruel.

By *bursting*. The patient being placed as before mentioned, the surgeon passes his two thumbs, well oiled, into the anus, and then forces them apart, so as to tear asunder the tissues lying at the bottom of the fissure. The subsequent treatment is the same as that after section.

Of these two operations, the first has not once failed to give immediate and permanent relief in a number of cases in which it has been used. The other has the sanction of some high authorities, but is certainly rougher, and perhaps less manageable as to the extent of tissue divided.

SECTION IV.

FISTULA IN ANO.

Causes.—Fistula in ano may originate in *ulceration and perforation of the mucous membrane of the gut*, as the result of the irritation produced by fecal accumulations (as in rectal stricture), or by foreign bodies, such as fish bones or grape seeds; it may also be traceable to an *abscess* which occurs externally to the bowel, in the ischio-rectal fossa, and is caused by injuries, such as blows or kicks upon the anus, or by exposure to cold, as from sitting upon wet grass or stones, or arises from suppuration around the prostate, or in a lymphatic gland.

Varieties.—Three forms are recognized by systematic writers, viz., (1) the *complete* fistula, in which there are two openings, one in the gut, and one on the surface of the body; (2) the *incomplete external* fistula, in which there is no inner opening, though the fistulous track can usually be traced to just beneath the mucous membrane; and (3) the *incomplete internal* fistula, in which the sinus communicates with the gut, but not with the external surface. The second and third varieties are also spoken of as *blind fistulæ*.

Symptoms.—The position of the external orifice is usually marked by a prominent papilla or granulation, while the internal opening can be felt by the finger in the rectum, or may be seen by the aid of the rectal speculum. There is a discharge of thin pus from the fistula, producing excoriation of the surrounding parts, which are commonly thickened and indurated. The fistula sometimes runs a pretty straight course, but is often tortuous and bent upon itself, being superficial from the external orifice to the margin of the sphincter, and then passing up deeply alongside of the bowel. There may be several sinuses opening externally, but all communicating with the same principal track; or there may be two or more independent fistulæ in the same case. Occasionally a slight form of fistula is met with, which opens at the margin of the anus within the position of the sphincter; but in the true "fistula in ano," the external orifice is an inch or more distant from the anus, while the track of the fistula passes through, or mere frequently quite outside of the sphincter.

Diagnosis.—This can readily be made by introducing a probe through the external opening, while the finger is placed in the rectum; the track of the fistula can thus be traced with a little trouble to its internal opening, which will almost invariably be found just above the internal sphincter, though a sinus may extend some distance further up the bowel. If there be no internal opening, the probe can be felt in the same locality, immediately beneath the mucous lining of the gut. In cases of *blind internal* fistula a bent probe may be introduced through the inner opening (which may be brought into view by the aid of the speculum) and carried downward in the direction of the fistulous track; in these cases, too, pressure on the external surface will cause an escape of pus into the bowel. It must be remembered that every sinus in the neighborhood of the anus is not necessarily a fistula in ano; it may, for instance, be connected with caries or necrosis of the tuber ischii, or may communicate with an abscess, which may arise within the pelvis, or may proceed from the hip-joint.

Fig. 399.

Fig. 399 is an incomplete or blind internal fistula, a sinus leading out of the bowel, but not opening through the skin. The sinus is seen at 1, terminating in a cul-de-sac at 2; 3, the cavity of the gut; 5, the anus; 4, the tissue between the gut and the sinus, within which tissue a part at least of the sphincter ani is apt to be comprised.

Fig. 400.

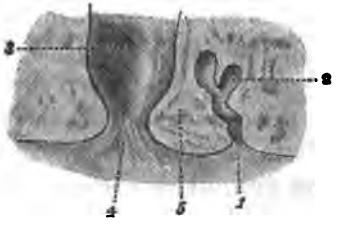


Fig. 401.

Fig. 400 is a blind or incomplete external fistula, the opening of the sinus, 1, being at the skin only; a small diverticulum, 2, is seen at one side of it; 3, 4, and 5, as in Fig. 399.

Fig. 401 is a complete fistula, a canal being formed between a point in the gut, 1, and a point in the skin, 2; the other references as in the former figures. The application of the ligature is shown in this figure.

The object of surgical interference is the destruction of the portion of tissue, 5, between the gut and the sinus. The extent of this varies greatly in different cases; sometimes there is but one small sinus, sometimes the tissue of the buttock is burrowed in various directions.

Operation.—The patient being etherized, if he desires it, the surgeon introduces the forefinger of his left hand into the rectum, its pulp toward the orifice of the fistula, while with his right hand he gently insinuates the blade of a probe-pointed curved bistoury along the sinus, pushing it clear through into the gut, so that by hooking the left forefinger over the extremity of the knife, it may be so steadied while withdrawn as to divide the whole bridge of tissue.

The knife must be firmly grasped, and prevented from slipping back along the sinus. If well curved, the probe-point may sometimes be brought out at the anus before the cutting is begun. A little lint, dry or oiled, is inserted into the cut, so as to fill it up from the bottom, and insure its thorough healing.

When the fistula runs but a short distance up along the bowel, it may be very conveniently operated on by passing a grooved director, curved with its groove on the concave side, through the sinus, and then carrying a knife along it just as in the case of any other fistulous track.

Another method of treatment, which is excellent in many cases, is that by means of the ligature; this is less formidable than the knife, and patients can go about and attend to business during the process of cure. Sometimes the thread, which should be of fine strong silk, may be carried through by means of an eyed probe. When this cannot be done, the following plan may be employed: a long piece of the silk thread is doubled, and its loop engaged in the nail of the left forefinger, which is passed into the bowel as far as the inner orifice of the fistula. Along this latter channel a probe is now passed, with a somewhat bulbous extremity, which is so manipulated as to get it caught in

the loop. The finger is now withdrawn, and the two ends of the thread twisted upon one another until the head of the probe is so grasped that when drawn back through the fistula it carries the thread with it. Now, untwisting the two ends, one is brought down through the sinus, while the other remains in the bowel, hanging out at the anal orifice. We have now a single thread, as in Fig. 401, which is to be tied near the middle of the bridge of tissue, 5, and then twisted until the loop begins to bear somewhat painfully, when it is secured by an adhesive strip. Every day or so the loop is tightened by twisting it in the same way, until it comes off and leaves the part sound.

Partial Occlusion of the Anus.—In this condition the anus, though not entirely occluded, yet presents so minute an orifice as not to permit the free escape of feces. The *diagnosis* of this from the more serious conditions which will be presently described, can be made by careful inspection, which will reveal a passage admitting the introduction of a probe. The *treatment* consists in enlarging the orifice by making radiating incisions with a probe-pointed knife, dilatation being subsequently maintained by the occasional use of a bougie.

Complete Occlusion of the Anus.—In this variety of malformation the anus is closed by a membrane of greater or less thickness, through which the meconium may be seen, and which bulges when the child struggles or cries. The *treatment* consists in making a crucial incision, excising the flaps thus formed, and bringing the skin and mucous membrane together with fine stitches—a bougie being passed from time to time to maintain the opening in a patulous condition.

Imperforate Anus.—Here the anus is completely absent, its normal position being occupied by a dense fibro-cellular mass, from a quarter of an inch to an inch in thickness, behind which the rectum terminates in a blind pouch. The *treatment* consists in making an incision of about an inch in length, forward from the coccyx, in the direction of the raphe of the perineum. The wound is then cautiously deepened, in the median line, following the curve of the sacrum until the gut is reached, when a free opening is to be made, and the meconium evacuated. The mucous lining of the rectum is then to be drawn downward

(if possible), to the external wound, and attached to the skin with sutures.

Occlusion of the Rectum.—The anus is well formed, and the nature of the case is, therefore, probably not suspected until after the development of symptoms of intestinal obstruction, when the diagnosis may be readily made by the introduction of the finger or a probe, the instrument coming in contact with a bulging membranous septum, from half an inch to an inch above the anal orifice. The *treatment* consists in making a small incision to evacuate the meconium, the wound being subsequently dilated with dressing-forceps or enlarged with a concealed bistoury. The use of the bougie must be continued daily for some months.

Imperforate Rectum.—In this condition the whole rectum is wanting, the anus being usually likewise imperforate. The colon terminates in a dilated pouch, in the iliac fossa, or opposite the promontory of the sacrum. The diagnosis of this condition from that of imperforate anus, is always difficult, and often impossible. The only resource is the formation of an artificial anus in the loin corresponding to the pouch as is shown on page 645.

Recto-Vesical and Recto-Urethral Fistulæ may depend upon congenital malformation, or may be caused by ulceration, usually of a malignant character, or by wounds accidentally inflicted, as in the operation of lithotomy. Recto-urethral fistula may also be due to the careless use of a bougie, or to the bursting of a prostatic abscess. The symptoms are sufficiently evident; urine escapes into the gut, and by flowing over the nates produces excoriation; while if the opening be large, fecal matter may enter the bladder, giving rise to cystitis and vesical tenesmus. When the fistula is due to the ulceration of a malignant growth, little can be done in the way of *treatment*, beyond the adoption of mere palliative measures, lumbar colotomy being justifiable when the feces escape into the bladder. In other cases, however, an attempt may be made to close the fistula, if small, by occasionally touching the part with nitrate of silver or with the galvanic cautery, while, if more extensive, a plastic operation may be tried, the fistula being exposed by means of a duck-billed

speculum, and its edges pared and brought together in a transverse direction; the bladder should be subsequently kept empty by the frequent use of a gum-elastic catheter, and the bowels locked up by means of opium suppositories. The author, since these sheets have been passing through the press, operated upon a case of recto-vesical fistula, produced by the careless use of a bougie, and which was cured by touching the opening into the rectum with a fine point of stick of nitrate of silver, completely cicatrizing and occluding the fistulous passage. The operation was performed by means of an anal speculum. The patients in these cases should be taught before the operation, to introduce the catheter for themselves, so that there may be no occasion for urine to flow over the wound until cicatrization is completed. Advantage may be sometimes derived from keeping the patient in the prone position, and in one instance Sir H. Thompson succeeded in effecting a cure by this alone. As a last resort, if the fistula be of old standing, and the aperture large, cauterization would probably not succeed, and then perhaps the only mode of treatment that could be adopted would be to introduce a grooved staff into the urethra, and cut through the sphincter upon this, thus laying the parts into one, and converting the anal into a perineal fistula; then by keeping the catheter in the bladder, and emptying this, granulations will spring up, and deep union be accomplished.

SECTION V.

STRICTURE AND TUMORS OF THE RECTUM AND ANUS.

Any part of the large intestine may be the seat of stricture, but it is by far most commonly met with an inch or two above the anus, or just below the junction of the rectum and sigmoid flexure of the colon. Three forms of rectal stricture may be described, viz., the *simple*, the *warty*, and the *malignant*.

Simple or Fibrous Stricture.—The constriction (which appears to be due to the presence of an adventitious structure of a fibrous character) is usually seated in the submucous areolar tissue, but more rarely in the muscular coat, or even in the mucous lining of the bowel. The *extent* of the stricture varies from a

few lines to an inch or more, the whole calibre of the gut being commonly involved, though not unfrequently the induration and thickening are most marked on one side. The *causes* of this form of stricture are chiefly *inflammation* or *ulceration* of the part, whether arising from chronic *dysentery*, from *wounds*, from the irritation caused by fecal accumulations or foreign bodies, or from the contact of *gonorrhœal* or *leucorrhœal* discharges. In other instances, stricture of the rectum may follow the cicatrization of a *chancroid*, or may occur as a *syphilitic* lesion, almost invariably, in this case, as a secondary or tertiary phenomenon. The fibrous stricture appears to be more common in women than in men.

Symptoms.—The symptoms of stricture of the rectum are difficult and painful defecation (the feces being flattened and ribbon-like, or passed in the form of scybala, mingled with mucus and perhaps blood), followed by various dyspeptic phenomena, and ultimately by the evidences of intestinal obstruction. Abscesses not unfrequently form in the areolar tissue around the gut, and communicate with the bowel either above or below the stricture, opening into the vagina, in the perineum, or in the gluteal region and giving rise to intractable fistulæ, which contribute much to the discomfort and exhaustion of the patient. In other cases, the formation of fistulæ is due to the escape of fecal matter, through ulcerations of the bowel above the seat of stricture. The more solid portions of the feces are detained above the stricture, the gut at this point becoming dilated into the form of a pouch; while the more liquid portions mingled with mucus or muco-pus find their way through the contracted part, leading the patient not unfrequently to complain of diarrhœa. When *intestinal obstruction* occurs, its symptoms may be gradually developed, or may be suddenly manifested owing to the complete occlusion of the gut by the lodgment of some foreign body.

Diagnosis.—The diagnosis of stricture of the rectum, when the seat of constriction is within three or four inches of the anus, can usually be readily made by digital examination, the finger being well oiled, and passed with the utmost gentleness. When the stricture is at a higher point, it may often be brought

within reach by directing the patient to bear down, or by making the examination while he is in the upright posture. The introduction of a bougie is not of much value for diagnostic purposes, as it is apt to catch in some of the folds of the rectum, or to strike the promontory of the sacrum, and thus lead to error. In making a digital examination, the surgeon should bear in mind that the rectum may be compressed by objects external to itself, as an enlarged prostate, a retroverted uterus, various forms of tumor, enlarged lymphatic glands, abscesses, etc.

Treatment.—The treatment of rectal stricture is both general and local. The general treatment consists in adopting those remedies which are appropriate to the causes producing it and to the alleviation of pain, which is often very severe. When occurring as the result of carcinoma the remedies employed for that condition, as given in vol. 1, p. 594 *et sequitur*, may be often advantageously employed in connection with local treatment. When it is the result of protracted dysentery, gonorrhœal or syphilitic diseases, the remedies applicable to the cure of these conditions will be of value in the treatment, together with the local measures referred to.

The *local treatment* consists in endeavoring to restore the part to its normal calibre by the cautious employment of oiled *bougies* of gradually increasing sizes; and in obstinate cases, especially if of traumatic origin, by making slight radiating *incisions* with a blunt-pointed bistoury. Rectal bougies are ordinarily best made of India-rubber, and should invariably be used with the greatest caution, lest laceration, or even perforation of the bowel, ensue. A bougie, of such a size as to be firmly grasped by the stricture, should be chosen, and, smeared with *Belladonna* ointment, may be introduced every third or fourth day, being left in for fifteen or twenty minutes on each occasion. If incisions are required, the knife should be introduced, guided and guarded by the left forefinger, the stricture being simply notched at several points. A bougie may then be passed, and followed in a few minutes by an opium suppository, the patient being kept at rest for a day or two subsequently. Various ingenious modes of effecting *rapid dilatation* have been proposed by surgeons, one of which was recently performed by

Dr. Richardson, of St. Louis, who reports a case of permanent stricture radically cured in a few days by the use of a *sea tangle tent.*

"Mr. B., age forty-five, sanguineo-nervous temperament, and extremely irritable, had suffered from fistula and hæmorrhoids for many years; was finally informed by his physician, an eminent allopathic surgeon, that he also had a stricture. After ineffectual attempts to overcome by dilatation, he became discouraged, and determined to try homœopathic means for his cure, and as a consequence I was called to see the case.

On digital examination, I found the location of the stricture to be about four and a half or five inches from the anus, being considerably higher than usually found; the rectum was very sensitive to the touch, and a number of small ulcers were revealed by examination with the speculum. The strictured part was so much contracted as scarcely to admit a No. 9 urethral bougie.

In thinking of the treatment I was at a loss to know what to do; first, it would be dangerous in the extreme to use the knife in a condition of the rectum so complicated, and the bougie, owing to extreme sensitiveness of the parts, he could hardly withstand once for an examination, much less every day or two for the purpose of dilatation. He was put under appropriate constitutional treatment, and a solution of *Hydrastis* was ordered to be used locally to the ulcers; and I took time to deliberate. Finally it occurred to my mind that I could use the *laminaria digita* or *sea tangle tent*, and the more I pondered over it the more feasible did it appear; accordingly I introduced one of the smallest tents, without great difficulty, and on withdrawing, twenty-four hours later, found, to my great delight, that I could, with very little pain or inconvenience, introduce a small rectal bougie. After allowing three days to elapse I introduced the largest tent I could procure, and on removal, after remaining twenty-four hours, found that the largest sized rectal bougie passed the former site of stricture readily, occasioning but a small degree of pain. For a few weeks I occasionally introduced the largest rectal bougie, and finding no tendency to recontraction or narrowing, I discharged him, and up to present date, some eight months later, he has had no return of

the stricture, and considers that he is as free from it as before it existed."

Should symptoms of intestinal obstruction come on, an attempt should be made to relieve the patient by the administration of copious enemata, or, if necessary, by opening the colon, either in the left or right loin, according to the seat of constriction.

Warty Stricture.—A peculiar form of rectal stricture, which might be appropriately called *warty*, has been described by Brodie, Curling, H. Lee, and others, in which numerous excrescences, resembling condylomata, occupy the margin of the anus and the interior of the gut, below the seat of stricture. These cases are believed by Gosselin to be of syphilitic origin. The profuse muco-purulent discharge, which is the most annoying complication of this form of stricture, may be somewhat controlled by the use of astringent injections and the application of a solution of nitrate of silver, and treatment internally employed as recommended in such cases, viz.: *Cinnabar*, *Merc. corros.*, *Nit. acid*, *Thuya*, *Phosph. acid*, *Lycopodium*, or *Sulphur*, according to indications.

Malignant Stricture.—In this form of stricture, the obstruction is due to a cancerous (usually scirrhous or encephaloid) growth, which may originate as an independent tumor, or as an infiltration in the tissues of the bowel. The *symptoms* do not at first materially differ from those of simple stricture, though the diagnosis can be made by digital examination, the induration of the malignant growth being of an irregular and nodulated character. When ulceration occurs, the act of defecation is commonly attended with great pain and a burning sensation, extending to the loins and thighs, the discharges containing a considerable quantity of pus and blood. Digital examination at this time reveals a soft, fungous mass, and the finger is withdrawn smeared with blood. As the cancerous tumor grows, it frequently involves neighboring parts, as the vagina, or bladder, giving rise, perhaps, to vesico-rectal or vagino-rectal fistulæ, and thus rendering the patient additionally miserable. By compressing the iliac veins, the tumor causes œdema of the lower extremities. Death may ensue from gradual exhaustion, at the end, perhaps, of three or four years, or at an earlier period from the occurrence of intestinal obstruction.

The *treatment* must be almost entirely constitutional, any attempts to excise or tear away the malignant growth being totally unjustifiable, and usually productive of serious results. See Carcinoma, vol. 1, p. 588.

Non-malignant Tumors of the Rectum.—These are commonly of a fibrous or fibro-cellular nature, occasionally sessile, but more often pedunculated, constituting the affection known as *polypus of the rectum.*

Rectal polypus is most common in children (though rare at any age), and may, unless the examination is made with care, be mistaken for a hemorrhoidal tumor, or for a prolapse of the mucous coat of the bowel. The polypus often protrudes through the anus at the time of defecation, and is frequently attended with hemorrhage; it may exist as a complication of the *painful ulcer* or *fissure of the rectum.* The surgical treatment consists in the application of a firm ligature, so as to strangulate the growth, which is then to be pushed up, and local applications used to relieve subsequent pain. The strangulated mass becomes detached, and is passed at stool in the course of a few days. Excision should be avoided on account of the risk of hemorrhage.

Sessile growths may be treated in the same way (the base being transfixed by a double ligature and tied in two halves), or may be more speedily removed by means of the *ecraseur.* A very vascular tumor of *papillary* or a *villous* character has been described as occurring in the rectum by Quain, H. Smith, and other writers. It is attended with constant, and sometimes profuse, hemorrhage, which gradually exhausts the patient. Repeated applications of strong nitric acid effected a cure in the case observed by Mr. Smith.

CHAPTER VIII.

OPERATIONS ON THE FEMALE GENERATIVE ORGANS.

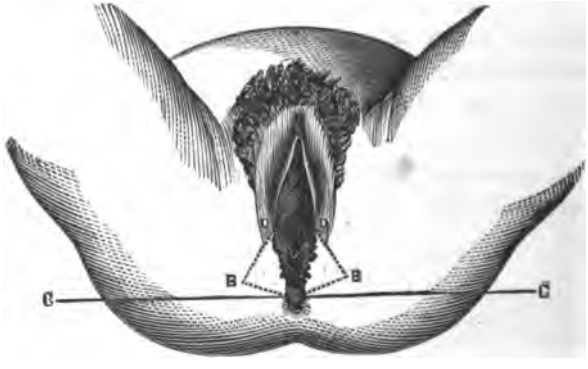
SECTION I.

LACERATED PERINEUM.

The usual operation for the relief of this deformity has been fully described on page 184, of the present volume, and the only reason for alluding to it in this connection is to show the recent operation of Prof. Hodgen, of this city, which has been successfully performed by himself and others, for the cure of this injury. This is a modification of the ordinary operation for lacerated perineum, and is thus described by the author.

"Within the past twelve months I have twice operated for ruptured perineum in the following manner:

Fig. 402.



C C, transverse line through the center of the septum. B B, first incision., B D and B D, lateral incisions carried from B B forward to D, the muco-cutaneous junction.

An incision is carried through the center of the lower border of the imperfect septum, between the rectum and the vagina, splitting it in the middle. The two ends of this incision are about

one and a half inches from median line and about half an inch anterior to a transverse line drawn through the centre of the septum. This incision is about one-third of an inch deep at its central point, with its lateral portions passing into the subcutaneous areolar tissue. Other incisions of equal depth and about an inch and a half long are carried from the ends of the first incision forward and toward the median line, until they reach the muco-cutaneous junction of the labia majora.

These thick, triangular flaps being dissected from their posterior lateral angle, but left attached along the inner or muco-cutaneous border, are now drawn forward over the vulva by their free angles, with the cutaneous surfaces toward the vagina and the cut surface externally. The borders which correspond to the line of the posterior or first incision are thus approximated and held by interrupted sutures, beginning at the anus, made by passing a fine needle armed with silk through, first from the cutaneous to the cut surface, and then in other flap from cut to cutaneous surface, so that when tied the knot shall be on the cutaneous side of flaps. This suture should be repeated every quarter of an inch until the free angles are reached.

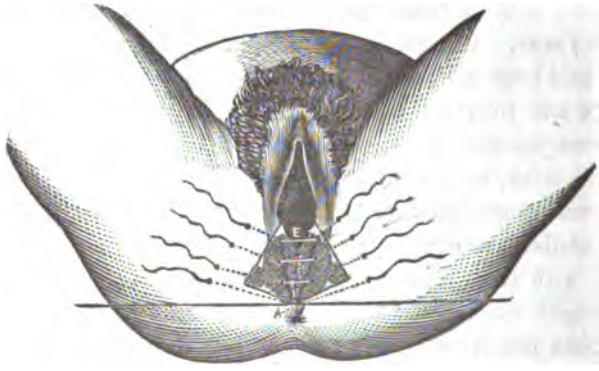
The usual deep sutures of silver wire are now placed, entering for the first one at a point on the buttock about an inch beyond the cut surface and nearly opposite the outer posterior angle, and, traversing deeply the septum between the rectum and vagina, it emerges at a point (on the opposite buttock) corresponding to that of entrance.

The second suture is placed about half an inch anterior to the first and enters about an inch from the margin of the cut surface, and, traversing the tissues, emerges from the cut surface near the attached line of the flap, and passing across external to flaps re-enters at a corresponding point near attached line of the other flap, traversing the tissues of this side to emerge through the skin an inch from margin of cut surface and half an inch anterior to similar point in first suture. A third, and if necessary a fourth, suture may be used anterior to those above described, being placed about one-half an inch apart.

The thighs are now brought together, pushing the flaps of loose skin forward toward the vagina, and held in position by tight-

ening and twisting the wires. It will be seen that the flaps, which are usually cut off, are made to serve a double purpose.

Fig. 403.



E is at the free margins of the skin flaps ; E A is line of junction, by interrupted sutures, of margins of flaps taken from incision B B. The dotted lines represent the portions of the wire which are buried in the tissues, and the black and white portions are external to the tissues.

They double the extent of the surfaces approximated, which increases the strength of the new perineum, and their cutaneous surfaces are continuous with the vagina, thus furnishing an apron which prevents the vaginal discharge and urine from flowing into the cut.

In these two points consist the advantages claimed for the modified operation.

The margins of the flaps, which correspond to the outer borders of the denuded surfaces, are without sutures, leaving thus an opening for the discharge of pus from any part of the denuded surfaces which may not unite by first intention, and preventing the formation of openings for the discharge of pus along the line of the sutures."

Dr. M. A. Pallen, also of this city, has recently performed the operation above described on three patients.

While this work is passing through the press, the author was called upon to perform an operation for cleft perineum, and succeeded beyond his most sanguine expectations in the procedure above described, and which he heartily indorses as an operation of great value.

SECTION II.

VESICO-VAGINAL FISTULA.

The *treatment* of vesico-vaginal and other varieties of urinary fistula met with in the female sex, belongs rather to the department of Gynæcology than to that of General Surgery. I shall, therefore, only indicate the principles upon which the various operations for the relief of these affections are founded. For more information touching this important subject, the student is referred to the comprehensive treatises of Sims, Emmet, Thomas, Agnew, Ludlam, and others. The excellent work of Prof. Ludlam, just published, affords ample instruction in this branch, and deserves to have a place in the library of every accomplished surgeon. From being the opprobium of our art, the operative treatment of vaginal fistula, through the labors of American surgeons, has been placed upon the very pinnacle of surgical achievement.

If a urethro-vaginal or vesico-vaginal fistula be very small, an attempt may be made to effect its closure by the application of the actual or galvanic cautery, or by touching the edges with nitric acid and holding them together with *serre-fines*, a plan which has been recently recomended in some cases by Spencer Wells. The large majority of fistulæ, however, require an operation, which essentially consists in paring the edges of the opening, and approximating the raw surfaces in a transverse direction by means of sutures, which are left in place until firm union has occurred.

Operations for Urinary Vaginal Fistulæ.—The points which require special consideration are—1, the position of the patient; 2, the mode of exposing the fistula; 3, paring the edges; 4, introduction of the sutures; 5, fastening the sutures; 6, use of the catheter during the after-treatment; and 7, the time at which the sutures should be removed. The patient should be prepared for the operation by attending to the state of the general health, by subduing local inflammation, and by dividing any cicatricial bands that might interfere with the success of the

treatment. The bowels should be relieved the night before, and an enema given on the morning of the operation, while to avoid the suffering, both physical and mental, to which this would otherwise necessarily give rise, the patient should invariably be anæsthetized, unless there be some special reason to the contrary.

1. *Position of the Patient.*—The best is, I think, a modification of that known as the knee-elbow position, the patient being supported upon pillows or on a well-padded double-inclined plane, with the hips elevated, and the head and shoulders depressed, the thighs widely separated, and held apart by assistants; Sims and Emmet, however, prefer a semi-prone position, the patient lying partly on the left side with the thighs flexed—the right rather more than the left—and the breast resting upon the table, while Simon, of Rostock, adopts the supine position, with the hips and thighs much raised, and Wells recommends the ordinary lithotomy position, with the hands and feet fastened together with bandages or straps.

2. *Exposure of the Fistula.*—This may be done with an ordinary Sims's speculum, held by an assistant, but may be more conveniently effected by means of Emmet's modification of that instrument, if the semi-prone position is chosen, or by a similar modification described by Wells, if the patient be placed either on her back or in the position here recommended. These modifications of Sims's speculum consist in the adaptation of a fenestrated blade, which fits over the buttock or sacrum of the patient, and thus keeps the instrument in place without the aid of an assistant. A bright light is necessary for the operation, the best illumination being afforded by placing the operating table near a high window; if this cannot be obtained, an Argand lamp and reflector may be substituted.

Fig. 404.

3. *Paring the Edges.*—This may be done with either knives or scissors, according to the fancy of the operator; a convenient form of knife is one with a double-edged blade, bent at an angle with the shaft. The sides of the fistula may be steadied by

means of suitable forceps, or one or more hooks with long handles, while the paring is effected by transfixing the part with the knife, and cutting first in one, and then in the opposite direction, so that a complete ring is denuded. In doing this, some surgeons cut perpendicularly to the plane of the vesico-vaginal septum, while others bevel the edges by cutting in an oblique direction, so as to spare the mucous membrane of the bladder. Langenbeck again, and, more recently, Collis, of Dublin, have advised that the edges of the fistula should be split, so as to obtain a broad raw surface without cutting away any tissue whatever. Provided that a broad surface is obtained for adhesion, it probably makes little difference which particular plan is adopted. Before proceeding to the next step of the operation, all bleeding should be checked by torsion, by pressure with a piece of sponge mounted on a handle or "sponge-holder," or by throwing in a stream of cold water with a syringe.

4. *Introduction of the Sutures.*—The material generally chosen for the suture, in this country, is, in accordance with the practice of Sims and Bozeman, silver wire; and this seems to me, upon the whole, preferable to the other substances used for the purpose. Simon, however, employs a silken, and Ulrich, of Vienna, a hempen suture; while Wells considers, and probably with good reason, the choice of material much less important than has been commonly supposed. Wutzer employed the hare-lip pin and twisted suture, and the same plan with various modifications has been since adopted by Metzler, of Prague, Mastin, of Mobile, and Watson, of Edinburgh. The sutures, whether of silk or metal, may be conveniently introduced with short well-curved needles held by suitable forceps, or with needles eyed near the point, and mounted in handles like the ordinary nævus needle. Sometimes the silk or wire may be threaded upon two needles, each of which is introduced from the vesical surface of the fistula; or an eyed needle, threaded, may be passed through one margin, and a notched needle, unthreaded, through the other, the loop of the thread being then caught in the notch and thus drawn through; or, again, the surgeon may adopt a plan similar to that of Mr. Avery, in the operation for cleft palate. Special needles have been devised for this operation by Druitt, Startin,

and others, but I am not aware that they possess any superiority over the simpler implements above recommended. The passage of the needle from within outward may be aided by steadying the part to be transfixed with a blunt hook bent at an angle to its shaft, and when wire is used, advantage may be derived from drawing it over a notched "feeder," which prevents it from cutting through the margin of the fistula. When the edges have been beveled or split, the sutures should be passed so as not to encroach upon the vesical mucous membrane, but this may be included when the fistula has been pared perpendicularly to the septum. The sutures should be passed about half an inch from the free margin of the fistula, and should be about a sixth of an inch apart. The fistula should invariably be closed in a *transverse* direction, so at to form a cicatrix at right angles to the long axis of the vagina. A single set of sutures may be used, or a deep and superficial set, according to the fancy of the operator.

5. *Fastening the Sutures.*—If of silk, the sutures are to be tied in an ordinary surgeon's knot, all the knots being made on the same side of the fistula; wire sutures may be conveniently twisted with the fingers, or, if the fistula be high up, with the "wire twister" devised by Coghill; or the ends on either side may be passed through a metallic plate and secured with clamped shot (as in Sims's earlier operations); or Bozeman's ingenious modification, known as the "button suture," may be substituted; or the surgeon may employ one of the may shields and splints, which have been devised by Simpson, Brown, Agnew, and others. In the majority of cases, however, the simple interrupted suture will, I think, be found more satisfactory than any other. As a test of the accurate closure of the fistula, an attempt may be made to pass a probe between the stitches, and the bladder may be injected with milk or colored water.

6. *The Catheter.*—It is by the large majority of writers thought very important to introduce a catheter—Sims's "sigmoid" instrument is the best—immediately after the operation, and to keep it in place during the after-treatment. Simon, however, has discarded the catheter altogether, except in cases of retention, when he introduces the instrument at intervals of three or four hours; while Wells introduces at first a small vulcanite

catheter, but removes it as soon as it causes any irritation or discomfort. If the catheter is used, great care must be taken not to let it become clogged with mucus.

7. *Removal of the Sutures.*—This may be done while the patient is in the semi-prone position. Silk sutures should be withdrawn about the sixth or seventh day, and wire sutures from the eighth to the fourteenth; it is better to retain them unnecessarily than to remove them prematurely.

The bowels should be locked up for about two weeks, and cleanliness insured by daily syringing of the vagina. If the urine be ammoniacal, the bladder may be washed out through a double catheter.

Modifications required in Special Cases.—When the fistula is placed in the upper part of the vesico-vaginal septum, care must be taken not to implicate the ureters in the operation. Neglect of this precaution may lead to failure, from the ureter opening in the vagina above the cicatrix, or even to death, from occlusion of the ureter and consequent uræmia. In cases of *vesico-utero-vaginal* fistula, the anterior lip of the uterus, or possibly the posterior lip, must be utilized in closing the opening: in the latter case, the patient is rendered sterile, and the menses escape through the urethra. In cases of *vesico-uterine* fistula, the anterior lip of the uterus must be slit up until the opening is exposed, when its edges may be freshened and united with sutures.

Fig. 405.

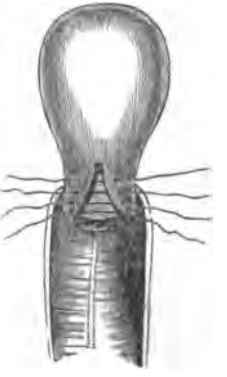


Fig. 405. In cases of very great deficiency of the vesico-vaginal septum the operation of *transverse obliteration of the vagina*, as employed by Simon and Bozeman, may be necessary: this consists in paring the anterior lip of the fistula, and attaching it to the previously denuded posterior wall of the vagina, so as to completely close the orifice of this canal; the menses subsequently escape through the urethra, but the patient is rendered sterile and unfitted for sexual congress. Hence, when applicable, a better plan, also suggested by Bozeman, is to endeavor to lessen the antero-posterior diameter of the fistula,

by daily dragging down the neck of the uterus, with forceps, for some weeks prior to the operation, which is then performed as in an ordinary case of vesico-utero-vaginal fistula.

Hypertrophy of the labia, to a limited extent is not unfrequently met with, one labium hanging down considerably below the other. In these cases it will often be found that the enlargement is due to a kind of solid œdema, originally dependent perhaps upon a fissure or ulcer of the part. In other cases again, large fibro-cellular tumors form as outgrowths from the natural structures in this region; these may require removal by simple excision.

Large condylomata or *verrucæ* are often met with here, as the result of gonorrhœal or syphilitic disease, forming at last irregular pendulous masses, which may require extirpation, either by knife or scissors. A large nevus has been removed by ligature from this situation, and in fact almost any growth that occurs in the fibro-cellular tissue may be met with here.

Cystic tumors are not unfrequently met with in the labia, and may sometimes resemble pretty closely the ordinary forms of inguinal hernia, for which, however, their incompressibility, irreducibility, and the absence of impulse on coughing, will prevent their being confounded. These cysts may require removal by a little simple dissection, and usually contain a dark, turbid, or sanguineous fluid, and sometimes atheromatous matter. Tolerably free hemorrhage may follow their removal, the excitable tissues of the labia being cut into. This may however always be arrested by pressure and a T bandage. Occasionally they project from the inside of the vagina, and then require removal by dissection or ligature, as can be best practiced.

An *imperforate vagina* is occasionally met with in young children, and occasions a good deal of anxiety to the parents. This condition, however, may always be very readily and speedily removed by tearing up the canal, as it were, by dragging upon its walls in opposite directions and breaking through the adhesions, which are little more than epithelial, with the thumb nail, a blunt probe, or the handle of a scalpel, and then introducing a small pledget of lint moistened with *Hypericum* lotion.

An *imperforate hymen* has occasionally been met with, caus-

ing great inconvenince by the retention of the menstrual secretion, which may accumulate to an immense extent, and become converted into a kind of chocolate-colored grumous fluid; in these cases, incision of the membrane is the only remedy. Occasionally the surgeon's advice may be sought by married women, for a rigid and only partially perforate hymen, when incision with a probe-pointed bistoury, and dilatation with a sponge tent may be required.

Absence of the uterus and ovaries with imperforate vagina is occasionally met with in women, otherwise perfectly well developed. In such cases as these the true condition may be detected by an examination per rectum, and especially by the introduction of a catheter into the bladder whilst the finger is in the rectum, when the point of the instrument will be felt thinly covered through the gut. No surgical interference can be of any avail in such cases, and an attempt to restore the vagina might lead to the opening of the peritoneal cavity.

Hypertrophy of the clitoris is occasionally met with; this organ becoming enlarged, elongated, and pendulous, and in some cases attaining an enormous size. When enlarged, it may give rise to a good deal of irritation, and require excision, an operation that would probably be followed by rather troublesome hemorrhage.

Removal of the clitoris, even though not much enlarged, has of late years, been recommended as an allopathic means of cure in some forms of erotomania. Dr. Erichsen performed the operation for this purpose on a patient of Dr. Horsbrugh's, and found some difficulty in stopping the bleeding, which at last required the application of the actual cautery before it could be arrested. The operation was followed by marked improvement in the young lady's mental condition.

Tumors of various kinds are met with in the interior of the vagina, springing from its walls. These may be of a cystic character, but occasionally true mucous polypi are found dependent and projecting from the side of this canal. These may most readily be removed by transfixing their base by a double whipcord ligature, and then strangling it. In performing this operation, however, when the tumor grows from the posterior

wall, care must be taken to ascertain by proper digital examination, that a portion of the rectum has not been dragged down into its base.

Prolapsus of the anterior or the posterior wall of the vagina may occur, giving rise in the first instance to protrusion of the bladder or *cystocele*, in the next, to a *rectocele ;* in either case, but especially in the first, occasioning very serious and troublesome consequences, amongst which, chronic irritation of the mucous membrane of the bladder, with perhaps phosphatic deposits in the urine, are the most marked. These protrusions may be supported by the use of properly constructed belts or pessaries. In some cases the surgeon may feel disposed to undertake plastic operations, having for their object the narrowing of the vaginal orifice by freely paring the opposite portions of its walls, bringing together the freshened surfaces by means of the quilled suture, and thus procuring narrowing of the canal and permanent support to the protruded part. The success of such operative proceedings will greatly depend on attention to detail. The mucous membrane at the orifice of the vagina should be dissected off from about half an inch below the meatus on one side, to a corresponding part on the other, in a strip about three-quarters to an inch wide; the dissection being carried well up posteriorly in the fourchette. Two or three deep, and as many superficial sutures should be passed; the deep being left in for about five, the superficial for seven days. Great attention should be paid to cleanliness, the patient lying on her side with a catheter in the bladder communicating with an india-rubber tube to carry off the urine, and the bowels constipated by proper remedies.

Various discharges connected with the female organs of generation fall under the observation of the surgeon; these may occur from the external organs, from the mucous membrane covering the cervex uteri, or from the interior of the cavity of that organ. These discharges, when proceeding from the mucous membrane covering the external organs or lining the vagina, are frequently, though not necessarily, of a gonorrhœal character; and then require to be treated in the way that has been mentioned under that head.

When these discharges proceed from the cervix or the interior

of the os uteri, they will commonly be found to be dependent upon a chronically inflamed or congested condition of the organ, or upon a papillated, granular, fissured, or ulcerated condition of the mucous membrane, often connected with more or less local thickening and induration of subjacent structures. These various conditions, often of a very persistent, insidious, and destructive character, have of late years been fully recognized by the labors of some of the French surgeons, and in this country their pathology has been greatly elucidated by Simpson and Bennet. To Dr. Bennet especially is due the great credit of having pointed out the true pathology of various uterine diseases that were previously but imperfectly recognized, and of having shown that many of the so-called functional diseases of the uterus are in reality dependent on congestion, inflammation, and other structural lesions of this organ.

These uterine discharges, occurring usually as the result of chronic inflammation and its consequences—just as we find on other mucous surfaces, as that of the urethra, throat, or eyelids —are attended by various symptoms indicative of local distress, such as pain in the back and thighs, and more especially in the left groin, with dysmenorrhœa and usually a good deal of sympathetic constitutional irritation, terminating in impaired digestion, malnutrition, and anemia. It is in this condition of the system that many of the so-called hysterical affections are so apt to arise; and the surgeon will often find that the most inveterate case of neuralgia of the joints, the spine, the hip, or the breasts, —amaurotic, and other obscure affections connected with nervous irritation—are primarily dependent on chronic uterine disease, and it is only by attacking and removing this that he will remedy the secondary mischief. On examining the condition of the cervix and os uteri in these cases, by means of the speculum, various morbid changes will be observed in them; the cervix is perhaps thickened, indurated, or knobbed on one side, the os is frequently patulous, and the mucous membrane covering these parts will be observed to be erythematous, congested, and perhaps excoriated; not unfrequently in a granular condition, closely resembling what may be observed in some forms of granular conjunctivitis. In other cases, again, true ulceration may

exist both upon the cervix and within the os. These ulcers, abrasions, excoriations, or by whatever term they may be designated, are unquestionably a fruitful source of mischief in this situation, giving rise to considerable thickening of subjacent structures, usually to abundant muco-purulent discharge and much sympathetic irritation. Their characters closely resemble corresponding forms of disease met with on the mucous surface in other situations, not attended by less of substance, but by the development of small pointed granulations or papillæ, from which the discharge is poured forth.

The *treatment* of these various affections of the uterus has been materially simplified since their pathology has been better understood, and practitioners are now generally agreed as to the necessity of the employment of constitutional local measures for the removal of these morbid states, as well as appropriate internal medication according to the various conditions present. To the surgeon who is in the habit of managing local disease on other mucous surfaces, and of removing the structural lesions that result from chronic inflammation in other organs, the treatment of these cases can present little difficulty, as it is conducted on precisely the same principles that guide him in the management of similar affections elsewhere.

The various *displacements* to which the uterus is liable, whether downward, constituting *prolapsus*, or in the direction of the axis, being twisted, and either *retroverted* or *anteverted*, are causes of much local suffering and constitutional disturbance, and commonly require surgical treatment. These various conditions will frequently be found dependent on inflammatory congestion of the fundus, in consequence of which the organ becomes as it were top-heavy, and is titled to one side, or descends bodily in the pelvis. The treatment, under such circumstances, must have reference to the removal of the local turgescence by topical applications, the employment of hip-baths, the recumbent position, and appropriate internal treatment; occasionally assisted, perhaps, in twist of the organ, by attempts at replacing it by introducing the uterine sound into its cavity, or when it is prolapsed, by supporting it with appropriate pessaries and the abdominal bandage.

Tumors of the uterus are of various kinds. The most common are those of a fibrous character; these are often of considerable size, and have been found weighing many pounds; they may occupy almost any portion of the uterus, either projecting into the peritoneal cavity, occupying the interior of the organ, or dependent into the vagina. These tumors seldom occur before the age of thirty or forty, and are not very amenable to treatment. In some cases, however, considerable benefit results from attention to proper remedial agents,* the occasional application of local washes and the use of supporting bandages properly adjusted.

Polypi are not unfrequently met with growing from the inner surface of the uterus, usually from the posterior aspect or fundus. These growths are generally oval or pyriform, smooth, hard, and insensible, and the cause of repeated hemorrhages which exhaust the patient; and it is a remarkable fact, that in many cases the most violent bleeding proceeds from the smallest tumors. In other cases, the tumors of the uterus are of a soft fibro-cellular, vesicular, or mucous character, attended, like the harder ones, by free hemorrhage.

The *operative* treatment of polypi† consists in effecting the extrusion of the polypus from the uterus by drawing it down with forceps, or, if this cannot be done, by dilating or incising the neck of the womb and administering *Secale*, and in then dealing with the growth by excision, evulsion, ligation, or the use of the *ecraseur*. It may be occasionally necessary to attack the polypus while still within the uterus, but the operation is, under such circumstances, attended with great danger. This may usually be readily enough effected by means of a whip-cord ligature applied by the double canula, which has been variously modified and a good deal improved by different surgeons. The ligature should be gradually tightened, and usually cuts its way through in from three to five days; the tumor swelling, decomposing often with a good deal of fetid discharge, which requires to be carefully syringed away by means of dilute chlorinated lotions. It is a

* See Tumors and their treatment, vol. 1, p. 569 *et sequitur*.

† See Polypoid Tumors and their treatment, vol. 1, p. 579 *et sequitur*.

useful precaution not to apply the ligature too near the uterine end of the pedicle, as cases have occurred in which, by so doing, the surgeon has given rise to serious and even fatal inflammation of the womb. Any portion of pedicle that is left will gradually undergo absorption.

The *cauliflower excrescence* from the uterus attended by copious discharge, is a rare and dangerous affection. The only operative treatment that appears to be of any avail, is to draw down the neck of the uterus by means of a vulsellum, and then to excise the tumor with the surface from which it grows. This operation is not attended by any very serious hemorrhage, and succeeds in ridding the patient effectually of her disease.

Malignant affections of the uterus usually commence in the form of scirrhous tubercle or ulceration of the cervix, attended by the ordinary local and constitutional symptoms of this affection; there is much offensive discharge, and cancerous cachexy speedily sets in.

The *treatment* of these cases must be purely medical, with local soothing applications and cleanliness. Excision of the diseased cervix has been recommended, and was formerly a good deal practiced; but this is a cruel procedure, and one contrary to every principle of good surgery, as it is impossible to rid the patient of scirrhous disease by the partial removal of the affected organ, and its complete extirpation cannot be thought of. Tumors, however, of a simple character, requiring removal are occasionally met with, springing from the cervix; they must be excised by putting the patient in the position for lithotomy, drawing the uterus well down with forceps and removing them with the knife; this has been done during pregnancy, and even during parturition, with good effects.

Vaginismus is the name given by Sims to an affection which consists in a hyperæsthetic condition of the nerves distributed to the vaginal mucous membrane at the position of the hymen, leading to a spasmodic contraction of the sphincter vaginæ muscle, which renders coitus intensely painful, and, indeed, usually impossible, and thus practically makes the patient sterile. The spasm of the sphincter may be elicited by the slightest touch of the finger, or even of a camel's hair brush. Vaginismus may

be an idiopathic affection occurring in persons of a hysterical temperament, or may be due to some local cause, such as fissure of the vagina or rectum, papillary tumor of the meatus, inflammation of the womb or vagina, eczema or prurigo of the vulva, neuralgic tumors, etc. The *treatment* consists in removing the cause, if this can be ascertained, and in the administration of appropriate remedies internally, and the local use of medicated lotions. Attempts may be made to relieve the spasm by the use of vaginal dilators, or, if necessary, by a resort to operative treatment. The simplest operation for vaginismus consists in sudden dilatation or partial rupture of the sphincter vaginæ muscle, effected by introducing the thumbs and forcibly separating them (the patient being etherized), as in Recamier's and Van Buren's method of treating fissure of the anus. If this fail, the remains of the hymen may be excised, and the sphincter partially divided by a deep incision on either side of the perineal (as recommended by Sims), or the pudic nerve may be cut—by direct incision, as originally recommended by Burns—or subcutaneously, as preferred by Simpson. These operations sometimes afford only temporary relief, and the constitutional treatment appropriate to neuralgia must therefore not be neglected after their employment.

SECTION III.

OVARIAN TUMORS.

Ovarian tumors of a cystic character are commonly met with. The cysts may be uni- or multi-locular, and vary greatly in the nature of their contents. These may be either solid or fluid,—often a combination of the two. If fluid, the liquid is usually more or less viscid, albuminous, dark, and variously colored. Ovarian tumor invariably tends to progress to a fatal termination; in some cases, rapidly, in most, gradually, occupying many years in its course.

The treatment of ovarian tumor may be conducted:—1st, by medical means; 2nd, by tapping; 3rd, by tapping, conjoined with auxiliary measures; 4th, by injection; 5th, by extirpation.

1st. *Medical means* has exercised in many cases great influence in retarding often curing ovarian tumors.*

2nd. *Tapping* in ovarian dropsy may be done, as for ascites, through the linea alba; but not unfrequently the tumor presents more distinctly at some other part of the abdominal wall, and may be emptied through the linea semi-lunaris, or, if multilocular, may require the trocar to be inserted at different points into its separate compartments. It has been conclusively shown by Spencer Wells, whose experience in cases of ovarian disease is probably greater than that of any other living surgeon, that the prospect of recovery after ovariotomy is not lessened by the fact of the patient having been previously tapped once or oftener; and hence there need be no hesitation in employing this simple operation, either to assist the diagnosis in a doubtful case, or as a means of affording temporary relief before resorting to graver measures. Special care must be taken to prevent the escape of the cystic contents into the peritoneal cavity (an occurrence which might be followed by peritonitis), by using Thomson's "siphon trocar," or some similar instrument. Though in the large majority of instances tapping acts only as a palliative, it has occasionally been followed by permanent recovery; an additional argument in favor of the practice which has been recommended. *Tapping through the vagina or rectum* is occasionally preferred to the ordinary operation through the abdominal parietes.

3rd. *Tapping, conjoined with other means*, has occasionally succeeded in effecting a cure of the disease. These auxiliary means are of various kinds:—firm pressure; incision of the cyst; excision of a portion of its wall, plugging the aperture in it with a tent; the introduction of a catheter or tube; the establishment of a fistulous opening leading into the interior of the cyst, either through the anterior abdominal wall or through the vagina, have all been adopted in addition to simple tapping; and however much these different procedures may vary in detail, they are all conducted on one principle, viz., that of causing the gradual contraction of the cyst and the cohesion of its walls, a principle of

* See Cystic Tumors and their treatment, vol. 1, p. 575.

treatment which is only applicable to unilocular cysts, and hence can only be had recourse to in a small number of, and those the simplest, cases of ovarian tumor.

4th. *The injection of tincture of iodine* has, of late, been successfully employed both in this country and on the continent. After the tumor has been tapped, from four to six ounces of the tincture should be injected through a catheter passed down the canula and left in. In some cases no constitutional disturbance follows; in others, a severe febrile paroxysm; and in others again, peritonitis has resulted. This method of treatment has been very successful in many cases, and it is well deserving a more extended trial than it has as yet received. It is only applicable, however, to non-adherent, unilocular cysts.

Differential Diagnosis.—*Fecal accumulations* in the cæcum or other parts of the large intestine have been mistaken for ovarian tumors; the diagnosis may commonly be made by digital examination *per vaginam*, the fecal tumor imparting a characteristic doughy sensation to the touch.

Fibro-muscular Tumors of the Uterus can usually be distinguished from ovarian growths, by observing that in case of the former there is commonly uterine hemorrhage and leucorrhœa; the uterine sound or probe enters further than in the normal state; the tumor which is often multiple, is usually hard, and by vaginal exploration is found to be irregular in outline and continuous with the uterus; and, finally, if the uterus be moved by means of the sound, the tumor moves with it. On the other hand, in a case of ovarian tumor, there is neither menorrhagia nor leucorrhœa; the uterine sound enters only to the normal distance; the tumor, which is usually solitary, often fluctuates, and is smooth and not continuous with the uterus; and, finally, the uterus can be moved without the tumor moving with it. It is to be noted, with regard to the last diagnostic point, that it is the *uterus* and not the *tumor* which must be moveable; for the upper part of a solid uterine growth may be moveable, while its base is so tightly wedged in the superior strait of the pelvis, that no motion can be communicated to the mass through the uterine sound.

Ascites can commonly be distinguished by the character of the tumefaction, which in abdominal dropsy is uniform, but in ova-

rian disease is localized at first to one or other iliac fossa; by the flattening of the abdomen in the recumbent posture, owing to the ascitic fluid gravitating to the sides of the peritoneal cavity; by the change in the line of dullness upon variation in the patient's position; by the resonance anteriorly when the patient lies on her back, owing to the intestines floating upward; by the prominence of the recto-vesical pouch, in which fluctuation can be detected by the finger introduced into the vagina; by the presence of a distinct wave when the patient rolls in bed; and by the coexistence of signs of disease of the heart, liver, or kidney, the skin being often harsh and jaundiced, and the feet œdematous at an early period of the affection. In dropsy from disease of the ovary, on the other hand, beside the local character of the swelling in the early stages, it is found that, owing to the fact of the fluid being contained in a tense cyst, there is no flattening of the abdomen nor anterior resonance in the supine posture; little or no variation in the line of dullness; no prominence of Douglas's cul-de-sac; no abdominal wave when the patient rolls in bed; and no evidence (except by a coincidence) of disease of other viscera. Finally, in a doubtful case, the diagnosis may be made by examining the fluid withdrawn by tapping, which, if the disease be ovarian, will probably be found to contain altered blood-cells, epithelial scales, masses of granular matter, oil globules, and crystals of cholestearine.

Cystic Disease of the Broad Ligament so closely resembles that of the ovary that diagnosis is frequently impossible, though if the fluid removed by tapping is found to be non-albuminous and like that of ascites, there would be strong reasons for believing that the ovary was not implicated. Though the diagnosis of ovarian tumors can, in most instances, be made with tolerable certainty, by careful and repeated examinations, yet cases occur in which the most skillful manipulations fail in arriving at a correct conclusion; and it has happened that ovariotomy has been performed without an ovarian tumor being found, the morbid growth being perhaps connected with the uterus, kidney, spleen, or omentum. The inability in certain cases in arriving at a correct diagnosis, is one of the strongest arguments against the propriety of the operation; notwithstanding this, there are cases,

and they are not a few, where ovariotomy may be considered justifiable, as much so as the operation for stone, or the ligation of an artery, although in each instance errors have been committed.

Solid Tumors of the ovary do not as a rule call for operative interference, and the same may be said of those tumors which contain both *solid* and *fluid* elements, with the exception of the fibro-cystic tumor, or cystic sarcoma, which may occasionally be properly removed by ovariotomy. Hence the remarks which follow are to be understood as applying to the treatment of *cysts* of the ovary, which are of much commoner occurrence than the other forms of tumor. The question whether or not a tumor of the ovary be cystic, can usually though not invariably be decided by noting the presence or absence of fluctuation, upon external, and especially upon vaginal palpation. In any case of doubt, an exploratory puncture with a small trocar should be resorted to. There may be a *single* cyst, or the tumor may be *multilocular*; in the latter case the secondary cysts may sometimes be recognized by palpation, and the contained fluid is usually darker and more viscid than that of a cyst which is unilocular; single cysts, moreover, rarely attain a very large size; the distinction is of importance as regards the prognosis of the case, single cysts being occasionally curable by milder measures than ovariotomy, and offering a better prospect of recovery after that operation, than multilocular growths. Another point which is usually considered of great importance as regards the prognosis of ovariotomy, is the presence or absence of adhesions; these may sometimes be detected by careful palpation and auscultation, but, on the other hand, may exist without giving any evidence of their presence; it is probable, however, that, as remarked by Spencer Wells, the prognosis after operation is more influenced by the general condition of the patient than by the size and condition of the tumor.

Ovariotomy, or the formal extirpation of a diseased ovary, was suggested by Wm. Hunter and recommended by John Bell; but the first surgeon who actually resorted to the operation was McDowell, of Kentucky, who performed the first ovariotomy in the year 1809. This case was successful, the patient surviving thirty-two years. McDowell repeated the operation about a

dozen times, with varying success, and his example was followed by a few surgeons both at home and abroad, but for many years the feeling of the profession at large was, that ovariotomy was an unjustifiable procedure, and it is within a comparatively short period only that this operation has been generally accepted as a legitimate resource of surgery. Among those who have acquired most distinction as ovariotomists may be particularly mentioned Clay, Baker Brown, Tyler Smith, Wells, Bryant and Keith, among British surgeons; W. L. and J. L. Atlee, Kimball, Dunlap, Peaslee, Beebe, and Thomas, in our own country, and Koeberle, in France.

The operation is not usually a very difficult one, but is always one of great gravity, the mortality in the hands of the most skillful ovariotomists averaging from 28 to 30 per cent. This is in itself no valid objection to the operation, for the death-rate is less than that of many other operations which are universally recognized as legitimate; but it is surely sufficient to render the surgeon very cautious in his prognosis, and to induce him to neglect no means of satisfying himself both as to the accuracy of his diagnosis, and as to the applicability of the operation to the particular case with which he has to deal. As Spencer Wells justly remarks, "it is seldom that a surgeon is called upon to perform ovariotomy in order to save a patient from imminent death. There is generally as much time for discussion as in the parallel case of lithotomy in the male adult. And in both cases, the responsibility of operating, with the full knowledge that if the patient be not saved by the operation he or she is killed by it, must be fairly faced." This responsibility, moreover, is one which the surgeon has no right to throw upon the patient; every woman knows that, after an operation like ovariotomy, she may die or she may get well, and it is to the superior knowledge and wide experience of the surgeon that she looks for advice as to whether the operation is or is not desirable in her particular case. The ultimate decision in this, as in every other case, must of course rest with the patient, but the surgeon should honestly and plainly express his opinion, whether it be favorable or unfavorable; and if, after a full and careful consideration of all the circumstances of the case, he is brought to the conclusion

that the operation is, upon the whole, not advisable, he should simply decline to operate.

The *Operation of Ovariotomy* may be performed as follows: The patient's bowels should have been emptied a day or two previously, and by means of an enema on the morning appointed for the operation. The temperature of the room should be at least 70 deg. Fahr., and the table well covered with blankets; the patient should be thoroughly anæsthetized, and at the last moment the contents of the bladder should be evacuated by means of the catheter.

The first incision is made to correspond as nearly as possible to the position of the linea alba, and may reach from about an inch or an inch and a half below the umbilicus to within two inches of the pubes, though, in many instances, a smaller wound may be sufficient. Wells's statistics, however, go to show that provided the incision does not extend above the umbilicus, its exact length in inches does not affect the result of the operation. The dissection is cautiously continued until the peritoneum is reached, when, all hemorrhage having been checked, this membrane is opened by picking it up with forceps, making a small cut, and then introducing the left forefinger, upon which as a director the wound is enlarged to the full extent of the external incision. A small quantity of serum now usually makes its escape, when the cyst wall probably presents itself immediately below the wound; should a fold of omentum or a loop of intestine intervene, these should be carefully lifted off and put to one side.

The surgeon then proceeds to investigate the extent of adhesions, if there be any, by introducing first two or three fingers dipped in lukewarm "artificial serum," then a curved steel sound dipped in the same, so as to sweep around the base of the tumor, and finally, if necessary, the whole hand. The "artificial serum," the use of which was suggested by Dr. Peaslee, consists of half an ounce of table-salt, six drachms of white of egg, and two quarts of water. If the adhesions be extensive, or if the tumor be now ascertained to be chiefly or entirely solid, it may be necessary to carry the incision *above* the umbilicus—this being done by a curve to the *left* side, so as to avoid wound-

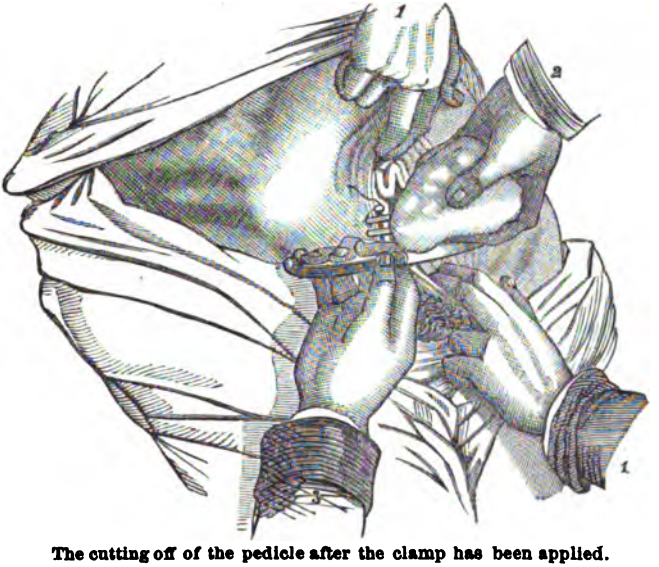
ing the round ligament of the liver. Should the adhesion be found so firm and extensive as to forbid the hope of removing the tumor, the surgeon may attempt the treatment by drainage, incision, partial excision, or injection of iodine, according to the character of the cyst—whether single or multilocular—and the nature of its contents, which may be ascertained by making an exploratory puncture with a small trocar. If the adhesions be less firm and extensive, those which are accessible may be carefully separated by the fingers, thus completing what may be called the second stage of the operation.

The third stage consists in turning the patient on her side, and then lessening the size of the tumor by tapping the cyst, or the principal cysts, if there be more than one—a good instrument for the purpose being the winged trocar and canula of Spencer Wells, or the ingenious hollow trocar, devised by Dr. Mears. The fluid may be conveyed away through a flexible tube, while the cyst wall is held forward with vulsellum forceps, and compression of the abdomen kept up by the hands of an assistant. The sac having been sufficiently reduced in size, is now gently drawn out through the external wound, any remaining adhesions being severed by the hand, by a small cautery iron (or the galvanic cautery), by an *ecraseur*, or by scissors, according to the peculiar circumstances of the case. If any hemorrhage occur, it may be controlled by torsion, by styptics, by the cautery, or by the ligature; in the latter case, silver wire should be used, or, which would perhaps answer equally well, the antiseptic ligature of Prof. Lister. If the adhesions be inseparable, it may be necessary to leave a portion of the cyst wall.

The next step is to *secure the pedicle* of the tumor, so as to prevent hemorrhage. This may be done by means of the ligature or the clamp, by dividing the pedicle with the *ecraseur*, or the actual cautery; or by applying torsion to each individual vessel. The stump of the pedicle, if sufficiently long, should be fixed between the lips of the wound; but if too short for this, must be returned into the abdominal cavity; or it may be "pocketed" in the deeper part of the incision (as suggested by Storer, of Boston), the external wound being accurately closed above it. When the stump is to be fixed in the external wound, the use of the *clamp*

is probably the best method of securing the pedicle. Fig. 406. Several varieties of clamp have been employed, those devised by Wells, Koeberle, Atlee, and Dawson, being perhaps the best.

Fig. 406.



The cutting off of the pedicle after the clamp has been applied.

When the stump is so short as to render its restoration to the abdominal cavity necessary, a different plan must be adopted; here the surgeon may choose between slow division of the pedicle and the application of torsion to each separate vessel, the use of the actual cautery, and the employment of the ligature. *Torsion* has not been resorted to sufficiently often to allow a positive opinion as to its merits. If the *ligature* be employed, the pedicle is transfixed and tied in two parts, when the ends may be brought out at the lower end of the wound (Clay's method), or may be cut short and dropped into the peritoneal cavity, as advised by Tyler, Smith, Peaslee, and Beebe; if the short cut ligature be used, it should be rendered antiseptic in the way recommended by Prof. Lister. If the *cautery* be used (as is done by Baker Brown), the surrounding parts may be protected by the use of the clamp-shield devised by Prof. Storer.

Dr. Beebe, of Chicago, is entirely in favor of torsion to all the bleeding vessels, and the stump returned to the abdominal

cavity. He records several cases operated upon in this way with the most satisfactory results.*

The pedicle being secured, and the tumor removed, the surgeon examines the other ovary (excising it also, if it be diseased), and then, having cleansed the peritoneum by careful sponging, closes the wound with large harelip pins, or with deep and superficial sutures, and applies *Staphysagria* dressing, or lint moistened with *Calendulated* oil, supporting the whole abdomen with a broad flannel bandage. The suture should be made of silver or flexible iron wire, and the deep set should pass through the whole thickness of the abdominal wall, including the peritoneum.

The *after-treatment* consists in adopting means to prevent the occurrence of peritonitis, which is the cause of death in about one-fourth of the fatal cases. The patient should be kept perfectly quiet and tranquil, and fed upon liquid diet for ten days or a fortnight after the operation. A Sims's catheter should be retained in the bladder during the first four or five days, and *Aconite* be given to control febrile excitement. If the bowels should become greatly constipated, a simple enema may be given on the eighth or ninth day. The chief sources of danger, beside shock and nervous prostration, are secondary hemorrhage, peritonitis, and septic poisoning. Hemorrhage must be arrested by exposing or opening the wound, and securing the bleeding vessel in the pedicle, and peritonitis is to be treated by the usual remedies in such cases. Koeberle applies an ice-bag on either side of the incision, as a prophylactic against both of these complications. Should symptoms of septic poisoning supervene, the lower part of the incision should be opened sufficiently to allow the introduction of an elastic catheter, through which disinfectant solutions may be injected and the peritoneal cavity washed out, as recommeded by Dr. Peaslee, and *Arsenic*, *Lachesis* or *Carbolic acid* given internally. This surgeon reports several successful cases, in one of which no less the one hundred and thirty-five injections were made in the course of seventy-eight days. The best disinfectants for the purpose are probably the liq. sodæ chlorinatis and carbolic acid, either being of course, very much diluted. Attention must be given to the use of proper

* Ovariotomy: a clinical report of eight cases.

remedies throughout the treatment of the case, according to the conditions that may arise in each instance. The sutures may be removed, one or two at a time, from the fifth to the tenth day.

The following case of ovarian tumor, cured by electro-galvanism, will be of interest to the profession: Mrs. R., aged thirty-three years, married, and residing in Missouri, consulted me concerning a lump in her side, as she described it, and which had been increasing gradually for the last three years. Her menses, previous to the last year, had been little removed from a normal condition, but lately were disposed to irregularity in period and quantity. The tumor was first felt distinctly a little over one year ago, in the lower part of the abdomen on the left side. Previous to this there had been a feeling of tension and weight; the walls of the abdomen seemed thick, and gave rise to more or less uneasiness; general health but little impaired. The patient complained of little or no pain in the part, and, excepting the conditions above stated, enjoyed good health.

To be certain in my diagnosis, the patient was ordered to be placed in bed, lying upon her back, her clothes removed, and knees drawn well upward toward the abdomen to relax the muscles. The anterior wall of the abdomen was found rotund and regular in outline, with dullness on percussion over the surface of the left iliac region, and not affected by change of position. A smooth, circumscribed mass was felt lying in the left iliac fossa, and, upon manipulation, fluctuation was discovered. Introducing a finger into the vagina, and pressing against the uterus, my hand lying flatwise upon the abdomen and pressing downward, a distinct tumor was felt. The uterus was normal, but thrown over a little to the right side; no connection seemed to exist between it and the tumor.

I felt sure that the case was an unilocular cyst of the left ovary, and concluded to try the effects of the electro-galvanic current, upon the same principle as my friend, Prof. Danforth, of Chicago, had employed it in the case of a large hydrocele, with the most triumphant success.

Having appointed a time for the operation, and procuring three gold needles to be used in the process, and a twenty-cell battery,

I approached the operation, not without some timidity, as I was traveling over new ground and feared the uncertainty lying before me. The more I reflected over the principles involved in the curative process, the more hopeful I became as to the result. Preparing the patient for the operation, adjusting the battery, and applying over the tumor, which was the size of a large cocoanut, a heavy steel ring, forcibly held downward by an assistant, I plunged into the sac, one at a time, the three gold needles prepared for the purpose. Now placing the *positive* electrode upon the back, and the *negative* in contact with the needles, the current was kept up for nine minutes through the sac. The patient only complained of pain and smarting in the back. The battery was applied as before and continued until the skin surrounding the needles showed evidences of cauterization, when they were withdrawn. The last application of the galvanic current was continued sixteen minutes. Upon examination of the tumor, its elasticity was gone, and in place of the fluctuation so plainly felt before, there appeared a "boggy," doughy mass, very unlike the characteristics previously experienced. This satisfied me that a change had taken place in the contents of the tumor, and giving the patient a dose of *Aconite* 3d every two hours, left her apparently comfortable; returned in a few hours, and found that the pulse was slightly accelerated, but no pain or other disturbance in the region of the ovary. Continued the *Aconite* every three hours, and called in the morning. Upon examining the tumor, some pain was experienced, of which the patient complained, but presented no other evidences of diseased action. In the evening, called again; pain in the iliac region increased, but no corresponding increase of the pulse. Substituted *Belladonna* 6th every three hours, and cloths wrung out with a lotion of *Belladonna* laid over the iliac region. Next morning, better; pain had almost entirely disappeared. Continued treatment for another day, and discontinued after that all medicine. In a week my patient was walking about; in three weeks she went home, the tumor having so far disappeared that it seemed no larger than a pullet's egg. Since then she has written me that she is well and never felt better in her life.

I give this to the profession as it occurred, and believe it is the

first case (at least, so far as I know) where the electro-galvanic current has been successfully applied for the cure of ovarian disease. The patient is entirely well. I trust others of my brethren will try this expedient before resorting to the knife, and if it shall supersede that practice, I shall be truly glad that I have stepped aside from the ordinary treatment of these cases to employ a safer and perhaps a more successful mode of practice.

Double Ovariotomy was first performed by Dr. J. L. Atlee, of Lancaster, Pa., in 1843, and has been since repeated by several surgeons, among whom may be particularly mentioned Dr. Peaslee, who reported his third case in 1864. The operation is attended with but little greater difficulty and risk than that of removing a single ovary, but has the necessary disadvantage of rendering the patient sterile.

Extirpation of both Ovaries and of the Uterus has been performed in some thirty or forty cases, usually, however, with a fatal result. In the light of past experience, the repetition of the operation cannot be recommended, though it is, of course, possible that wider observation may, at some future time, compel the rendition of a more favorable verdict with regard to this operation, as it has already done with regard to the simpler procedure of ovariotomy.

Cæsarean Section.—This operation may be performed with the hope of saving the child alone (in case of sudden death occurring to a woman far advanced in pregnancy), or with the hope of saving both mother and child, in cases of rupture of the womb, extreme deformity of the pelvis, etc. The operation consists in opening the abdominal cavity in the median line (as in ovariotomy), incising the womb, rupturing the membranes, and extracting with the least possible delay, child, membranes, and placenta. Bleeding is then to be arrested, the peritoneal cavity cleansed by sponging, and the wound of the abdominal parietes closed with sutures. Sometimes assistants have to keep the intestines from protruding through the wound.

When the mother is living, the contractions of the intrinsic muscles of the womb are usually sufficient to arrest all hemorrhage, and to prevent gaping of the uterine wound; if not, they may be stimulated by applying pure cold water.

Accurate closing of the abdominal orifice, by deeply placed sutures, and a subsequent treatment like that of ovariotomy, complete the operation.

The after-treatment is directed to the prevention of peritonitis. The Cæsarean section has been occasionally repeated on the same patient, in successive pregnancies, from two to seven times.

Nephrotomy for Renal Calculus.—Calculous concretions have been occasionally extracted from the kidney or ureter, in cases in which the existence of an abscess or urinary fistula has served as an indication for the proceeding, but the first formal nephrotomy for the removal of renal calculus appear to have been performed by an Italian surgeon, named Marchetti, in the latter part of the seventeenth century. Several concretions were extracted, and the patient recovered with a renal fistula. The revival of this operation has been recently advocated by T. Smith (in a paper in the *Medico-Chirurgical Transactions*, vol. 52), who recommends a longitudinal incision along the outer border of the erector spinæ muscle, extending downward four inches from the lower margin of the last rib. The incision is cautiously deepened until the finger can be placed upon the hilus of the kidney, when, if thought proper, this organ can be laid open. This operation does not involve the peritoneal cavity, so that there is little risk of peritonitis, while urinary infiltration is prevented by the depending position of the wound. The great objection to the procedure is the dificulty of deciding (1) whether renal calculus exists at all, (2) which kidney is affected, and (3) whether the calculus be not so adherent as to render its extraction impossible. Since the publication of Mr. Smith's paper the operation has been tried in two instances, but in neither case was any calculus found.

Extirpation of the Kidney.—In a case of urinary fistula which was caused by a wound of the ureter, unavoidably inflicted in the removal of the uterus and ovary, Simon, of Heidelberg, cut down in the left lumbar region and excised the kidney of that side, securing the renal vessels by ligature. The patient recovered. A similar operation has since been performed by Dr. Meadows, an English surgeon, in a case of cystic kidney, but the patient died on the sixth day.

Extirpation of the Spleen.—The spleen has been excised for traumatic causes, and in cases of cystic disease, and of chronic enlargement connected with leucocythemia—sixteen cases in all having been, according to Magdelain, recorded up to 1868. When performed for traumatic lesions, or for cystic disease, the operation has occasionally been followed by recovery, but in the leucocythemic cases has, I believe, invariably terminated fatally. Hemorrhage, either during or subsequent to the operation, appears to have been the usual cause of death, which in one of Bryant's cases occurred fifteen minutes after the patient left the operating table.

The results of splenotomy, under any circumstances, are not sufficiently encouraging to warrant a repetition of the operation.

Treatment of Abdominal Abscesses.—The surgeon is occasionally called upon to evacuate collections of pus which have been formed in connection with the liver, gall-bladder, spleen, kidney, intestinal canal, or ovary, or in the deep layers of areolar tissue found in the neighborhood of the broad ligament.

Hepatic Abscess is not unfrequently met with in tropical regions. The pus may occasionally find a vent into a neighboring portion of intestine, or may perforate the diaphragm and enter the lung, or finally may point externally. In the latter case surgical interference may be required, the *treatment* consisting in puncturing the abscess with a trocar and canula, the latter being provided with a stopcock as in the operation of paracentesis thoracis. The puncture should not be made until the signs of external pointing show that adhesions have been formed between the visceral and parietal layers of peritoneum, but if the other symptoms be urgent, an attempt may be made to hasten this occurrence, by the use of *Merc.*, *Hepar*, or *Silicea*, by making a superficial incision over the part, or by the introduction of acupuncture needles. The same means may be resorted to in dealing with other abdominal abscesses.

Biliary Abscess.—The surgical *treatment* of abscess originating in the gall-bladder, is to be conducted on the same principles as that of hepatic abscess.

Splenic Abscess is of rare occurrence. The *treatment* consists in evacuating the pus by means of a trocar and canula, as

soon as adhesion has occurred between the adjacent layers of peritoneum.

Perinephritic Abscess.—Collections of pus, originating in the areolar and adipose tissue around the kidney, may find a vent by bursting into the kidney itself, or into the bladder (the pus then escaping into the urine), by perforating the diaphragm and entering the thoracic cavity, or by opening into the vagina or bowel, or on the external surface, usually in the hypochondriac or lumbar region. This affection has been particularly studied by Trousseau, and mere recently by Bowditch, of Boston, the last-named author having particularly insisted upon the importance of early surgical interference. The *treatment* consists in making a puncture or incision to evacuate the contents of the abscess, as soon as the existence of pus has been ascertained with reasonable certainty; the opening should as a rule be made in the *lumbar* region, because the kidney can be reached from behind without wounding the peritoneum.

CHAPTER IX.

ORTHOPÆDIC SURGERY.

SECTION I.

DEFORMITIES OF THE ARM, HAND AND FINGERS.

Orthopædic surgery is that branch of surgical science which treats of the means of remedying deformities, congenital or acquired. Etymologically, the term should be used only with reference to the deformities of childhood, and might be taken to embrace a great variety of subjects, such as the removal of tumors, the reduction of dislocations, etc. In practice, however, the application of the term is limited to a few particular kinds of deformity, as wry-neck, lateral curvature of the spine, club-hand or club-foot, and contraction of joints not due to articular dis-

ease, while, on the other hand, no reference is intended to the *age* of the patient in whom these deformities occur.

Contraction of the Arm may be owing to disease of the elbow, to the retraction of the cicatrix of a burn, or to a contracted state of the biceps muscle—which latter condition may itself be variously due to *hysteria*, to *rheumatism*, or to *constitutional syphilis*. In *hysterical* cases, the proper constitutional treatment for that condition should be employed, the arm being, if necessary, extended while the patient is in a state of anæsthesia, and then kept in a straight position for a few days. In the *rheumatic* form, when the contraction is permanent and accompanied with organic change, *tenotomy* may be required. The operation is performed by slipping a tenotome flatwise beneath the tendon of the biceps from within outward, so as to avoid the artery, and then turning the edge of the knife forward and upward, effecting the section by cutting with a slight sawing motion while the arm is forcibly extended. The wound should then be closed and the arm placed in a sling, extension being applied after a few days by means of a screw-splint or weight.

Contraction of the Forearm and Hand is occasionally met with, as the result of excessive use of certain muscles, with disuse of others: the treatment consists in a change of occupation, with the employment of a straight splint, friction, galvanism, etc.

Club-hand is a rare affection, analogous to club-foot. It is usually complicated with a deformed condition of the lower end of the radius, and sometimes of the carpal bones. Two forms of club-hand are met with, in one of which the part is in a state of extreme flexion, and in the other of extension. The affection is sometimes congenital, but usually results from infantile paralysis, and is, according to Holmes, always accompanied by other deformities. The treatment consists in supplementing the action of the paralyzed muscles by means of India-rubber bands, attached to a light metal frame, and passing beneath a ring at the wrist. In inveterate cases, tenotomy may be required, followed, after the healing of the wound, by passive motion, aided by the use of friction and galvanism.

Contraction of the Fingers into the palm of the hand is not unfrequently met with, usually in old persons, as the result of an indurated state of the palmar and digital fascia, due apparently to a constitutional condition analogous to that of rheumatoid arthritis. The exciting cause of the affection is often the habitual pressure of the head of a cane, or of the handles of various kinds of tools. A similar contraction may be due to burns or other traumatic causes (in which case a scar would be perceptible), or to certain forms of *eczema*—an important point to be remembered, as the operation about to be described would not of course be applicable to that affection. The treatment of the deformity now under consideration consists in the cautious subcutaneous division of the contracted tendons, which may be effected by slipping a small tenotome beneath the tendon in the palm and cutting forward, the cure being completed by passive motion (after a few days), with frictions, bandaging, or the use of a screw-splint. Under this treatment, the fascial induration gradually yields, the ridges and furrows disappearing, and the part slowly returning to its normal state. Relapse is, however, not unfrequent (owing to the constitutional nature of the affection), and a repetition of the operation may therefore become necessary.

SECTION II.

DEFORMITIES OF THE LOWER EXTREMITY.

Contraction of the Hip.—Contraction of the muscles surrounding the hip may occasionally require tenotomy or myotomy, in cases of spasmodic rigidity of the lower extremities, of congenital luxation, or of chronic hip disease. The tendon which most often requires division is that of the adductor longus, though the operation is also sometimes performed upon the adductor brevis, pectineus, tensor vaginæ femoris, and rectus. Division of these muscles is performed in accordance with the principles of tenotomy in general, the knife being introduced behind the part to be divided, and the section then to be cautiously effected by cutting from behind forward.

Knock-knee or Genu-Valgum is a not uncommon deformity, consisting of a relaxation of the ligamentous and muscular struc-

tures of the knee-joint, allowing the articulation to yield in a direction inward and backward. The internal lateral ligament is elongated, while the external lateral ligament is rendered tense, together with the vastus externus and outer hamstring tendon. The inner condyle of the femur is, as compared with the outer, disproportionately large and prominent, while the popliteal space is somewhat obliterated. The affection is probably never congenital, but comes on during childhood, and is apparently connected in many instances with a rachitic tendency. Both knees are usually simultaneously affected, though the disease may be more marked in one than in the other. The treatment consists in the adaptation of an apparatus as follows: An iron rod, hinged at the hip, knee, and ankles, extends from a pelvic band to the sole of the shoe, and is provided with pads, straps, and buckles, by which the knee may be drawn outward; in severe cases, motion should be permitted at the hip and ankle only, the knee being fixed, and its displacement gradually rectified by means of the adjusting straps or a ratchet-screw. Division of the external hamstring tendon is occasionally resorted to as a preliminary measure, but according to Little, does not appreciably hasten recovery, and is therefore not to be recommended.

Outward Bowing of the Knee or Genu-Extrorsum is a condition which is the reverse of *Genu-Valgum:* the external lateral ligaments are relaxed, and the tibiæ themselves are commonly curved, giving the appearance known as "*bow-legs.*" This deformity is sometimes traceable to premature attempts at walking, and is usually connected with a rachitic vice of constitution. The treatment consists in the application of padded splints, so as to overcome the outward bending of the limbs, and at a later period, in the adaptation of suitable supports, so as to prevent a recurrence of the deformity. Mr. Marsh recommends forcible straightening of the curved tibiæ, even at the risk of producing fracture, this lesion being, as he justly remarks, easily repaired in rickety bones.

Contraction of the Knee, dependent upon shortening of the hamstrings, may occur in connection with anchylosis of the joint, or independently: the treatment consists in division of the hamstring tendons, followed by gradual extension, with passive motion, friction, etc.

Division of the Hamstring Tendons is thus performed: the patient being in the prone position, an assistant renders the parts tense, by fully extending the limb, and the surgeon then introduces the tenotome flatwise on the *inner* side of the *outer* hamstring, or *biceps* tendon (which is to be first divided), through a puncture which in the adult should be an inch above the point at which the tendon joins the fibula. By keeping the knife close to the tendon, the risk of wounding the peroneal nerve is avoided, and the section is then effected by cautiously cutting toward the skin. The *semi-tendinosus*, being superficial and prominent, is readily divided, but the *semi-membranosus* requires a freer use of the knife: it, however comparatively seldom needs to be cut. In operating on the *inner* hamstrings the tenotome should be introduced close to the *outer* (popliteal) side of the semi-tendinosus, as there is thus less risk of wounding the important structures in the popliteal space. After the operation, the wounds should be instantly closed with a firm compress (to prevent extravasation, or the entrance of air), and no attempt at extension should be made until the parts are entirely healed, which usually requires a delay of four or five days. Neglect of this precaution may give rise to wide-spread suppuration in the tissues of the ham.

When cicatrization has occurred, gradual extension may be made by means of a weight, elastic bands, or screw apparatus, or in some few cases forcible extension may be preferably employed, the patient being of course in a state of anæsthesia. Recovery may be further promoted by the assiduous practice of passive motion, aided by friction, douches, etc.

Club-Foot.—*Talipes* or *Club-foot* is a common deformity, which may affect one or both extremities, and may occur in either sex, though more frequently in boys than in girls. It may be *congenital* or *acquired*. There are four *primary* and as many *scondary* varieties of the deformity. The primary forms of club-foot are *Talipes Equinus*, *Talipes Calcaneus*, *Talipes Varus*, and *Talipes Valgus*, while the secondary forms are combinations of these, receiving the names of *Equino-Varus*, *Equino-Valgus*, *Calcaneo-Varus*, and *Calcaneo-Valgus*. All forms of club-foot depend upon contraction of

various muscles and tendons, which may result from spasm of the contracted parts themselves or from paralysis of the antagonistic muscles; in most cases, the bones of the foot are not altered in structure, but in inveterate cases of varus (which is the most common form of congenital talipes), the astragalus, scaphoid, and cuboid will all be found more or less atrophied and twisted, the ligaments correspondingly altered in length, the tendons distorted, and the muscles of the whole limb wasted. Adams indeed maintains that, in cases of varus, the astragalus is malformed from the moment of birth, the malformation probably being due to the pressure of the adjacent bones during intra-uterine life. In non-congenital club-foot, the muscles commonly undergo fatty degeneration, rendering the prognosis in these cases less favorable than in those which are congenital.

The *process of repair* after division of tendons consists, as shown by Adams, in the development, between the retracted ends, of a new material, which does not, as was formerly supposed, subsequently contract and bring down the shortened muscle, but remains permanently, though gradually assimilating itself in structure and appearance to the original tendon.

Talipes Equinus.—This is very seldom, if ever, a *congenital* affection, but is, on the other hand, the most common *non-congenital* form of club-foot, according to Tamplin, in forty per cent. of cases originating after birth, and in twenty-two and a half per cent. (or, according to Lonsdale and Adams, thirty-four per cent.) of all cases taken indiscriminately. The deformity in talipes equinus consists simply in an elevation of the heel, which may be so slight as merely to prevent the foot from being flexed beyond a right angle, or may be so marked as to force the patient to walk upon the toes and extremities of the metatarsal bones, as seen in Fig. 407.

Fig. 407.

Talipes equinus.

The *cause* of this deformity (in children) is very often disturbance of the nervous system during dentition, or from the irritation of intestinal worms, though some cases

depend upon general infantile paralysis; in adults, this form of club-foot may result from paralysis, from abscess or injury of the calf of the leg, or from habitually keeping the foot in a bad position (during the treatment of fractures, etc.), by which the patient acquires a "pointed toe."

The *treatment* consists in the *subcutaneous division of the tendo-Achillis*, about an inch above its point of insertion. The patient being prone, and the tendon rendered tense by depressing the foot, the tenotome is introduced flatwise (on either side, as most convenient) and carried across in close contact with the tendon, so as to avoid wounding the posterior tibial artery: the edge of the knife being then turned backward, the tendon is forcibly brought against it by still further depressing the foot, while the blade is given a slight sawing motion. An audible snap usually marks the completion of the operation, when the heel can be immediately brought down an inch or two further than before. Prof. Pancoast has in some cases advantageously substituted division of the lower portion of the soleus muscle for that of the tendo-Achillis. In very severe cases of talipes equinus, it may be necessary to divide the plantar fascia, or even some of the tendons of the toes as well: when the plantar fascia is to be divided, this should be done as a preliminary operation, the tendo-Achillis being for the time untouched, so that its tense condition may fix the heel and facilitate the "unfolding" of the arch of the foot. After the operation, the punctures made by the tenotome should be immediately closed with a piece of lint and adhesive strip. *Mechanical extension* may be begun from the third to the fifth day (not before the former), and may be conveniently effected by Adams's modification of Scarpa's shoe, which differs from those in ordinary use chiefly in having a transverse division of the sole-plate, corresponding to the transverse tarsal joint. In using this, as with all other forms of orthopædic apparatus, care must be taken to guard against excoriation, by frequently removing the instrument and bathing the skin with *Arnica* lotion. The extension must be effected very gradually, the maxim "festina lente" being in no cases more important than in these.

Talipes Varus is the most frequent variety of congenital

club-foot, being met with, according to Tamplin, in ninety per cent. of such cases. The deformity of varus is twofold, consisting in an inversion of the anterior two-thirds of the foot, which rotates upon a centre of motion constituted by the astragalo-scaphoid and calcaneo-cuboid joints, with an elevation of the posterior third by the contraction of the muscles of the calf. Fig. 408. When the latter displacement is particularly marked, the affection receives the name of equino-varus. The inversion of the front part of the foot is due to contraction of the tibialis anticus, tibialis posticus, flexor longus digitorum, and occasionally the flexor and extensor longus pollicis, the plantar fascia and flexor brevis digitorum being also sometimes more tense than in the normal state.

Fig. 408.

Talipes varus.

The treatment of this form of club-foot is best divided into two stages, the inversion of the front of the foot being remedied during the first, and the elevation of the heel during the second stage; in other words, the case is first to be converted into one of simple talipes equinus, and then treated as was directed in speaking of that form of the affection. In some very slight cases of congenital varus, the deformity can be remedied by simple manipulation and friction repeated several times a day, but in cases of ordinary severity, *tenotomy* should be resorted to, the best age for the operation being probably between the second and third month of life. The tendons to be divided in the *first* stage of treatment, are those of the tibialis anticus, and posticus, with sometimes that of the flexor longus digitorum, and the plantar fascia. The tibialis anticus tendon deviates from its normal direction, curving downward and backward across the inner malleolus, while the posterior tibial tendon passes from behind the inner ankle directly downward, or even with a slight backward obliquity. In dividing the latter tendon there is some risk of wounding the posterior tibial artery; hence it is well to

adopt Tamplin's suggestion of making a preliminary puncture, and then using a blunt-pointed tenotome. Should the vessel be wounded, it should be cut completely across, and a firm compress and bandage then instantly applied. If a traumatic aneurism form, it may be treated by compression, or by injection of the perchloride of iron.* Similar treatment would be required if the internal plantar artery should be wounded in dividing the plantar fascia. After tenotomy, the inversion of varus may be slowly overcome by bandaging the limb to a straght external splint, or by the use of a "varus shoe," provided with a *joint in the sole-plate* for effecting eversion. The *second* stage of treatment consists in dividing the tendo-Achillis, and in subsequently bringing down the heel, as in a case of simple talipes equinus. The time required for the cure of talipes varus varies from two months to a year, according to the age of the patient, and the severity of the affection.

Talipes Calcaneus, Fig. 409, is very rare as a congenital affection, though as a non-congenital disease, resulting from infantile paralysis (particularly in combination with talipes valgus), it is, according to Adams, comparatively common.

Fig. 409.

Talipes calcaneus.

Fig. 410.

Talipes valgus.

This form of club-foot depends upon contraction of the muscles of the front and outer part of the leg, the deformity, which is the reverse of talipes equinus, causing the patient to walk on the

* See Aneurism and its treatment, vol. 2, p. 191.

heel. In slight cases of the congenital variety, a spontaneous cure may be affected by the simple process of walking, but in most instances, tenotomy will be required, the tendons to be divided being those of the tibialis anticus, extensor communis digitorum, extensor proprius, pollicis, and peroneus tertius. The after-treatment consists in the application of an apparatus provided with an elastic spiral spring at the heel, to supplement the action of the tendo-Achillis. This form of talipes is occasionally combined with varus, constituting calcaneo-varus.

Talipes Valgus, or *flat*, or *splay-foot*, Fig. 410, is rare as a congenital, but sufficiently common as an acquired affection. The deformity is here the reverse of that seen in varus, the sole being flattened, the arch of the instep obliterated, and the foot everted. In severe cases, the heel is commonly depressed as well, constituting *calcaneo-valgus;* or, on the other hand, the heel may be elevated, constituting *equino-valgus*. Congenital cases of talipes valgus may often be cured by simple manipulation, or by bandaging the foot to an inside splint, with a wedge-shaped pad, as in Dupuytren's mode of treating fractured fibula. In other instances, tenotomy will be required, the parts to be divided being the tendons of the peroneus longus and brevis, and extensor communis digitorum, with sometimes the tendo-Achillis, or even the tendons of the tibialis anticus and extensor pollicis. The after-treatment consists in applying an apparatus to produce gradual *inversion*, with a pad to restore the arch of the foot.

Weak Ankles, which often precede the development of acquired talipes valgus, should be treated by the constitutionally indicated remedies, and by attention to the hygienic surroundings of the patient, and by the use of friction and the salt douche, with, if necessary, an elastic bandage, or light metallic lateral supports.

Treatment of Club-foot without dividing Tendons.—Mr. Barwell opposes the practice of tenotomy, in the treatment of talipes, on the ground that the affection is always the result of paralysis, and that divided tendons seldom reunite. He recommends instead, the employment of an apparatus, in which elastic cords supplement the paralyzed muscles, and counteract the action of those which are contracted. Without entering into

any discussion of Mr. Barwell's theoretic views (which are opposed to those of the leading authorities on the subject of club-foot), it will be sufficient to say, that while the ingenious mode of treatment which he advocates may undoubtedly effect a cure in mild cases, it will, as undoubtedly, fail in many of those which are more severe; and even in the slight cases, tenotomy (which has not been proved to do any harm), certainly abbreviates the time required for treatment. Indeed, it may be safely said, in the words of Mr. Adams, that the successful treatment of club-foot demands, in most cases, "a judicious combination of operative, mechanical, and physiological means."

Contraction of a Toe, usually the second, is commonly due to a tense state of the digital prolongation of the plantar fascia, and requires division of the offending structure; the operation should be done subcutaneously, opposite the base of the second phalanx, the toe being then straightened, and secured to a small pasteboard or wooden splint.

CHAPTER X.

RESECTIONS OR EXCISIONS OF THE JOINTS AND BONES.*

SECTION I.

GENERAL CONSIDERATIONS IN RESECTIONS.

The operation of *resection* or *excision* in cases of compound fracture and dislocation, appears to have been known to the ancients, was subsequently lost, and revived again during the first half of the last century by Cooper, of Bungay, who removed the lower ends of both tibia and fibula for compound dislocation of the ankle. The first resection for *disease of a joint*, appears to have been that performed by Filkin, of Norwich, in 1762, in a case of arthritis of the knee. The history of the introduction of

*See Gunshot Wounds, vol. 1, p. 665.

the operation of resection into the practice of surgery, is a subject of much interest, but cannot be entered upon within the limits of this work; the reader is respectfully referred, for information upon this matter, to the able monograph of O. Heyfelder, and to that of Hodges, of Boston. The applicability of resection to the various *traumatic* lesions of joints and bones by army surgeons during the war of the rebellion, has been already discussed in vol. 1, of this work, to which the reader is referred. I shall therefore, in the following pages, confine myself to a description of the operative procedure in the different regions of the body, and to a consideration of the applicability of resection in *diseases* of bones and joints, especially to caries and arthritis.

Indications for, and Contra-indications to Resection in General.—Resection is indicated in case a bone or joint is so extensively diseased that its removal is imperative; here the question is between amputation and resection, and the latter operation should always be preferred, provided that the circumstances of the particular case admit of a choice.

Resection is sometimes justifiable, where the amount of disease is not sufficient to warrant amputation, and yet where the *time* which would be required for a spontaneous cure would be so long as to render operative interference proper, or where the utility of the limb would be less after a spontaneous cure than it would be after removal of the joint; as in the elbow, where a cure by anchylosis would be particularly undesirable.

Resection is, on the other hand, *contra-indicated* by the extent of the diseased bone being so great that its removal would render the limb an incumbrance, and less useful than a well-formed stump; this is particularly the case in the lower extremity, but in the arm, provided that the hand be preserved, very considerable portions of bone may often be properly removed.

Resection should not as a rule be practiced in cases of *acute disease*, experience showing that amputation is under such circumstances better tolerated. Hence, if operative interference be necessary to preserve life, in a case of acute bone or joint disease, amputation will usually be indicated.

If the soft tissues around a diseased bone or joint be extensively diseased, infiltrated with lowly organized lymph, and rid-

dled with sinuses, the result of a resection is less apt to be satisfactory than under opposite circumstances, though the operation is not absolutely contra-indicated by such a condition.

Either extreme of life is considered unfavorable to resection, on account of the long period required for recovery after the operation, and, in the case of early childhood, on account of the risk of interfering with the growth of the limb, which is chiefly dependent upon the integrity of the epiphyseal cartilages. Roeckel, of Strasburg, however, from an examination of over twenty cases of arrested development, concludes that the shortening is less due to injury of the epiphyseal cartilages than to disuse of the limb owing to pain or to muscular atrophy—causes which would be equally active if resection were not performed.

A bad state of the general health, particularly if dependent upon organic visceral disease, as of the lungs, liver, or kidney, must always be considered a contra-indication to resection. The long confinement which usually follows the operation, with perhaps long-continued and exhausting suppuration, will seriously complicate the chances of recovery in such a case. Hence, if any operation at all be required in a patient suffering from advanced phthisis, or from Bright's disease, amputation will usually be the preferable procedure.

Process of Repair after Resection.—The growth of the *long bones* in *thickness* is accomplished by means of the periosteum, and in *length* by means of the epiphyseal cartilages. Hence, in resecting portions of the shafts of bones, it is of the utmost importance to preserve the periosteum, by the osteo-genetic power of which it may be hoped that the resected portion will be reproduced: another advantage of *subperiosteal* resection, is that, by preserving the membrane in question, the attachments of the various muscles are not disturbed. If the periosteum cannot be preserved—and this can rarely be done in resection of the *short bones*, as of the calcaneum—repair is effected by the wound filling with granulations, which are subsequently transformed into a dense, fibrous, cicatricial mass. In resections of the *joints* (particularly among patients who have not attained their full height), is is important not to remove the entire epiphysis, nor even to encroach upon the epiphyseal line; for, if this

be done, the subsequent growth of the limb will be deficient. This is especially important in the case of the *knee*, the lower epiphysis of the femur and the upper of the tibia being chiefly concerned in the growth of the lower extremity. An attempt, should, as a rule, be made to preserve the periosteum, in articular resections, particularly when, as in the case of the shoulder, elbow, or hip, a movable joint is desired—the effect of retaining the periosteum in these cases being, as shown by Ollier, to improve the shape of the new articulating surfaces, which measurably approach the form of those which were removed; in the knee, where the great object is to obtain firm bony union, the subperiosteal character of the operation is not so essential, though still desirable, as tending to diminish the amount of consecutive shortening.

Resections have for some reasons found more favor among British surgeons and those in some continental cities, than in our own country. They require judgment and skill on the part of the operator, endurance and courage on the part of the patient.

Various points are to be considered in regard to cases calling for a choice between resection and amputation: the state of the soft parts; the state of the periosteum; the extent of bone diseased; the involvement of one or of both the constituent parts of the joint; the object to be aimed at,—whether a movable or a consolidated condition of the bones; the age, medical history, and constitution or vital power of the patient.

If the soft parts are flabby and much broken down; if the periosteum is greatly thickened and diseased; if a large part of both or all the bones composing the joint is affected; if the patient is at or beyond middle age, has been suffering long, and is "demoralized," amputation is more promising of success. But in a child or young person, whose trouble is of recent date, with no great affection of the soft parts, and when but one bone, or but a small portion of each is involved, resection may be resorted to with some degree of hope.

We have, in these operations, to make our incisions so as to give us free access to the diseased bones, avoiding if possible the division of vessels, nerves, and tendons; and so as to provide for the escape of pus during the subsequent treatment. Often

the sinuses which exist in the neighborhood may be followed with advantage.

Operation.—Anæsthesia ought always to be induced, as these procedures are often not only painful, but tedious.

The instruments required are: scalpels, bistouries, and grooved directors for dividing the soft parts; dilators, blunt hooks, linen or muslin retractors, elevators, or the bone-director.

(This last named instrument is simply a large director, about ten inches in length; it is shaped like a sound for the urethra, and the groove extends along its back from the handle to the curve, or about six inches. It can therefore be readily insinuated around a bone which is to be sawn through, and rotated so as to bring its groove next to the bone; a chain saw may now be passed along the groove, or, if the ordinary saw be used, the soft parts are effectually held out of the way.)

For grasping and steadying the bone, various forms of forceps will be found useful: Fergusson's lion-jawed, or the ordinary duck-bill, straight or curved.

For dividing the bone, we may employ the common amputating saw, or Butcher's, the blade being movable, so that it may be set at any desired angle. Occasionally the chain-saw, or a very narrow-bladed saw (sometimes called a "metacarpal" saw), may answer a good purpose. The operator should also be provided with bone-nippers of various shapes, chisels and gouges, and a trephine. Artery-forceps, a tenaculum, ligatures, sponges, etc., must be at hand.

SECTION II.

SPECIAL EXCISIONS.

Scapula.—Excision of the scapula, complete or partial, may be required for various causes, as caries, necrosis, tumors, and some forms of injury, though in traumatic cases it is often necessary to remove the whole upper extremity as well. The operation may be done with a crucial incision, or, which is probably better in most cases, a T-shaped incision, as recommended by Syme, the transverse branch of the cut running from the acromion to the posterior edge of the bone, and the other passing

downward, at a right angle from the center of the former. If the operation be for *tumor*, the incisions should be merely skin-deep, the flaps being dissected off without cutting into the growth, which may, probably, be very vascular. It is advised by Fergusson and Pollock to liberate the posterior border of the scapula first, and then the inferior, turning up the bone from below upward as the operation proceeds. By this plan the subscapular artery can be controlled by the finger before division, and the risk of hemorrhage is thus considerably lessened. The subclavian artery should be compressed by an assistant throughout the whole procedure. In cases of *malignant disease*, the whole scapula should be excised, but under other circumstances a partial operation may suffice, there being certainly an advantage in retaining the head of the bone, acromion, and coracoid, when there is no reason for their removal. The clavicle should not be interfered with unless itself diseased. After the operation, the arm should be supported in a sling, and an axillary pad may be sometimes advantageously employed for a few days.

The history and statistics of this operation have been particularly investigated by Dr. Stephen Rogers, of New York, from whose valuable paper the following facts are mainly derived. The first surgeon who extirpated the scapula was Cumming, who, in 1808, successfully removed this bone, together with the upper extremity, for gunshot injury. Liston, in 1819, excised a large portion—about three-fourths—of the scapula for cancer, the patient dying a year later from a recurrence of the disease. The first case in which the *entire scapula* was removed, the arm being preserved, was that of Langenbeck, who, in 1855, excised the whole scapula, with three inches of the clavicle. Since then, complete excision of the scapula, with or without interference with the clavicle and head of the humerus (the arm being preserved), has been done by Syme (twice), Heyfelder, Jones, Hammer, Schuh, Michaux, Hamilton, Rogers, Pollock, and Steele—the twelve cases giving eight recoveries and four deaths; while of eight similar operations (subsequent to previous amputation at the shoulder), by Crosby, Mussey, Rigaud, Fergusson, Buck, Langenbeck, Busch, and Krakowizer, six recovered and two died. Total is thus quite as successful as

partial excision, thirty terminated cases of the latter operation, collected by Rogers, having given sixteen recoveries and fourteen deaths. The patient in one case died during the operation, while in another (fatal) case the operation was abandoned unfinished.

Clavicle and Ribs.—The *clavicle* may require partial or, in rare instances, complete excision, on account of caries, necrosis, tumor, or compound fracture. The inner extremity of the bone may also require resection, if it be so displaced as to produce dangerous compression of the œsophagus or trachea. In cases of necrosis the operation may be made subperiosteal, and presents no particular difficulties, a simple incision following the course of the bone being sufficient for the purpose. In cases of tumor, the operation is both difficult and dangerous, the principal risks being from hemorrhage and the entrance of air into the veins. The entire clavicle has been extirpated about a dozen times, and of eleven terminated cases which are on record, only three proved fatal.

Portions of the *ribs* have been frequently excised, in cases of caries, necrosis, compound fracture, wound of an intercostal artery, etc. The operation is not particularly difficult, but, except in cases of necrosis, when the periosteum can be detached, is attended with considerable risk of injury to the pleura or even the peritoneum. Thirty-seven cases mentioned by Heyfelder gave eight deaths.

SECTION III.

RESECTION OF THE JOINTS OF THE UPPER EXTREMITY.

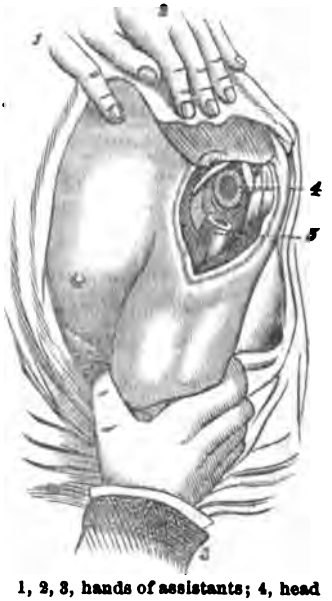
Resection of the Shoulder Joint.*—This may be required in cases of gunshot wound, or of disease. The chances of success are much greater if the glenoid cavity is healthy.

The patient being laid on his back on a strong table, with the affected shoulder raised and well exposed over the edge, an assistant compresses the subclavian artery against the first rib. In making the division of the soft parts, the surgeon may cut

* See Excisions of the Shoulder Joint, vol. 1, p. 708.

straight down parallel with the fibres of the deltoid, from a point a little back of the coracoid process, or he may make a flap of the muscle, cutting from without inward, as in Fig. 411. Reaching the cavity of the joint, he frees the long tendon of the biceps so that an assistant may draw it forward with a blunt hook. Then, another assistant rotating the arm, the muscles surrounding the joint are quickly divided, and by bringing the elbow toward the side, the head of the bone can be tilted out and sawed off.

Fig. 411.



1, 2, 3, hands of assistants; 4, head of humerus; 5, shaft.

If the chain-saw be used, it is simply slipped over the bone; if any other, the bone-director or some form of retractor or guard for the soft parts must be employed.

If the glenoid portion of the scalpula be diseased, it can be cut away with strong bone-nippers.

The pressure on the subclavian artery is now relaxed; any vessels that spring are tied; the wound is closed with adhesive strips, dressed with *Staphysagria* water, *Calendula*, or solution of *Carbolic acid*, a space being left for drainage, and the limb carefully supported parallel with the body, or with a sling and axillary pad. A pasteboard or tin trough answers a good purpose in keeping it steady for the first few days.

Another plan is, to transfix the soft parts with a catlin, as if to make a deltoid flap, and to cut downward for three or four inches; then, the knife being withdrawn, a linen retractor is passed above, and another below the bone, which is divided with the chain-saw. The upper portion may now be grasped with forceps, rotated, and its connections with the joint severed by touches with the knife.

To this method there is this objection, that the surgeon must

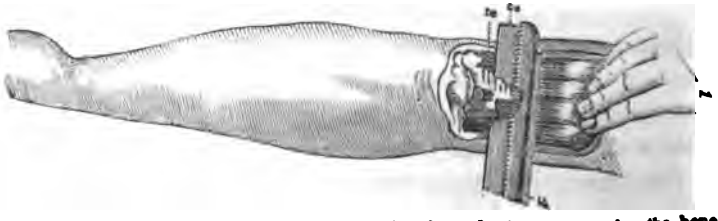
work with greater difficulty; and that the bleeding vessels are less readily secured, than by the others mentioned.

Humerus.—Resection of the shaft of humerus may be occasionally required in cases of compound fracture, especially as the result of gunshot injury, or may sometimes be necessary in cases of caries or necrosis. Resection is also not unfrequently called for in the treatment of ununited fracture, and when performed with the precautions recommended by Ollier, of Lyons, and by Bigelow, of Boston, is quite a successful procedure. The operation consists in making a single longitudinal incision on the outer side of the arm, between the muscular interspaces, and, after carefully dividing and stripping off the periosteum (which should always be preserved), removing as great an extent of bone as may be thought necessary with a chain-saw; the resected bony extremities should then be approximated and held together by means of a strong metallic suture, and the limb placed at rest on a suitable splint.

Resection of the Elbow.*—This operation is one of the most generally successful of its class. It must of course be done from behind (the large vessels being in front), and the ulnar nerve must be guarded from injury.

Operation.—Access to the part is best gained by turning the patient on his belly, the limb to be operated on being supported over the edge of the bed by an assistant. The surgeon stands so as to have the joint at his left; *i. e.*, on the inner side of the left arm, on the outer side of the right. If no sinuses exist, and he has therefore no plan marked out for him, he had better make a rectangular flap, such as is shown turned up in the

Fig. 412.



1, Hand of assistant; 2, head of bone; 3, strip of wood; 4, saw engaging the bone.

accompanying Fig. 412. This flap should be as wide as the joint,

* See Excisions of the Elbow, vol. 1, p. 711.

but the inner longitudinal incision must be made just to the radial side of the ulnar nerve, which lies in the groove behind the inner condyle. When the disease is extensive in the ulna or radius, or both, an H-shaped cut may be made, the transverse portion corresponding to the tip of the olecranon. In cutting the flap or flaps, all the tissues are to be divided, down to the bone; and if possible, the periosteum should be divided and stripped up with the other soft parts, so as to afford a chance for the development of new bone.

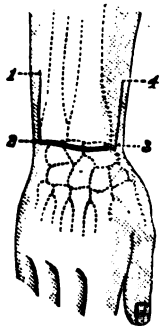
The flaps being turned up, the ulna is tilted backward out of the wound, a strip of wood placed under it, or a retractor, and the articular portion, with as much more as is deemed necessary, sawed off. Next, the head of the radius, if diseased, and if the saw has not already cut it through, is removed either with the saw or with bone-nippers. Lastly, the end of the humerus is in like manner tilted backward and sawed through. All bleeding vessels are now secured, and the wound closed with sutures; cold or warm *Staphysagria* water, or *Carbolic acid* lotion in warm weather may be applied, and the limb placed on a pillow, in an easy position, the patient being laid on his back. A splint is required only when there is great restlessness. After a few days, the patient may be allowed to get up, with the limb supported with a splint and sling. Almost always, fibrous tissue is developed between the sawn bones, and a good deal of use, of the forearm and hand especially, is acquired.

Resection of the Wrist Joint.*—This joint has been often resected, either wholly or in part, with considerable success; but on account of the small amount of tissue covering it (and what there is consists in great degree of tendons), as well as the fact that the usefulness of the hand depends upon the freedom and ease of its motions, it is a less favorable place for operations of this kind than the elbow. The lower portion of the radius may be removed by a single longitudinal incision along its border. The bone having been sawn through as high as is necessary, is tilted out, and its lower attachments divided by touches with a bistoury.

* See Excisions of the Wrist, vol. 1, p. 712.

The lower end of the ulna may be removed by a triangular flap being turned up so as to expose it, a strip of wood passed between it and the soft parts, and the saw applied.

Fig. 413.



1, 2, 3, and 4, the flap to be made and its relations to the bones.

In Fig. 413, the flap for removal of the lower ends of both the radius and ulna is shown. The transverse incision is on a level with the first row of carpal bones.

The statistics of wrist joint excision are not very favorable, thirty-one terminated cases tabulated by Hodges giving six deaths, eight subsequent amputations, and only fourteen really good results. By the recent introduction of Lister's method of operation, the chances of success seem, however, to have been considerably improved, though the mortality remains about the same—twelve terminated cases reported by Prof. Lister in 1865, giving ten satisfactory recoveries and two deaths.

Hand.—The *metacarpal bones* or *metacarpo-phalangeal joints* may be excised by simple longitudinal incisions on the back of the hand, the extensor tendons being held to one side, and the bone sections made with strong cutting-pliers. A similar procedure is required for excision of the *inter-phalangeal joints*, except that in this case the articulation should be approached from the side.

SECTION IV.

RESECTIONS OF THE JOINTS OF THE LOWER EXTREMITY.

Hip.*—Resection of the hip joint may be required in cases of injury (especially from gunshot wound), of *hip disease*, and possibly of *necrosis*, though in cases of the latter affection, it would usually be proper to wait for the spontaneous separation of the femoral epiphysis, which could then be extracted with comparatively little risk. Hip-joint excision has likewise been performed for *malignant disease*, for *anchylosis*, and for *rheu-*

* See Excisions of the Hip, vol. 1, p. 714.

matoid arthritis. Resection of the hip joint was suggested by Charles White, of Manchester, in 1769, but was first practiced by Anthony White, of London, in 1822. The first operation in this country was performed by Bigelow, of Boston, in 1852. A simple longitudinal incision on the outside of the limb will usually give ready access to the joint, but may be supplemented, if necessary, by a transverse cut forming a ⊢.

Resection of the Hip.—There are two entirely distinct classes of cases in which a surgeon might feel called upon to do operations which would come under this head:

1. Cases of anchylosis, the hip joint being consolidated at an incovenient angle, and the object being either to take away a portion of the femur near its head so as to correct the line of the lower limb, or to establish a ligamentous union which shall substitute as far as may be the original joint.

2. Cases of gunshot injury or disease of the hip joint, or *morbus coxarius*, in which the removal of the shattered or diseased head of the femur, and perhaps of part of the acetabulum, is called for, in the hope that there will be either fibrous or bony union established between the remainder of the bone and the os innominatum.

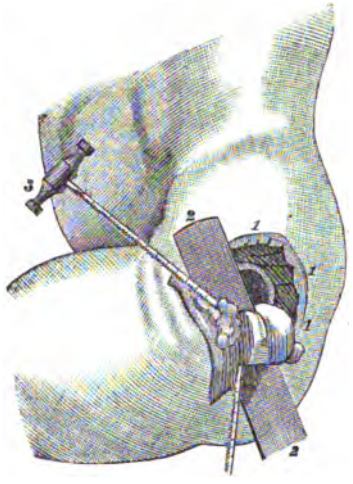
Cases of the first class are of course very rare in civil practice. According to Circular No. 2, S. G. O., U. S. A. War Dept., the death rate in cases operated on by military surgeons has been 90.6 per cent.

Cases of the second class are much more frequent and more promising.

Surgical Anatomy.—The hip joint belongs to the orbicular or ball-and-socket variety. Access to it can be best obtained from the outer side, since the large vessels run in front, the sciatic nerve is behind, and at the inner side we should have to go through a thick mass of tissues, besides the great inconvenience of working in an angle. Normally, the direction of the cervix femoris is upward, inward, and a little forward.

Operation.—When no sinuses exist which may be laid open, the surgeon has to choose between several forms of incision. The one shown in Fig. 414, is a semi-circular one, its convexity upward.

Fig. 414.



RESECTION OF THE HEAD OF THE FEMUR.—1, 1, 1, the circular incision. 2, 2, a flat and smooth piece of shingle placed under the bone. 3, the chain saw ready for removal of the head.

Another plan is to make a straight incision from five to seven inches long, just over the trochanter major, parallel with the axis of the femur. Still another is to make an S-shaped cut in the same place.

Whichever method is chosen, the patient is placed on a firm table, etherized, and the affected hip somewhat elevated. The surgeon makes his division of the skin and superficial fascia, and then either works down through the muscles, or cuts them across. Having exposed the joint, and laid it freely open, the head of the femur is tilted out, the soft parts protected by a slip of wood, a bone-director, or a muslin retractor, and the diseased portion of the femur separated by means of a saw. Either the chain-saw or the ordinary one may be used.

The acetabulum, if diseased, is now gouged, or cut away with bone-nippers; if the case is one of gunshot wound, any loose pieces are extracted. Any vessels that spring are carefully secured; and the wound is closed with sutures.

A splint may sometimes be used with advantage to keep the limb steady, for the first few weeks; but in most cases the ordinary weight-extension, as in fractures of the thigh, with sand-bags to give lateral support, will answer every purpose.

The method adopted by Dr. J. R. Barton, in his celebrated case,* is thus described:

A crucial incision was made over the great trochanter; the soft parts were dissected up from around the bone, the four flaps being turned up. Everything being cleared away from the neck of the bone, a retractor was placed beneath it, and the trochanteric portion almost divided with a strong narrow-bladed saw.

*See N. Am. Med. and Surg. Journ., vol. iii, pp. 379 and 400. 1827.

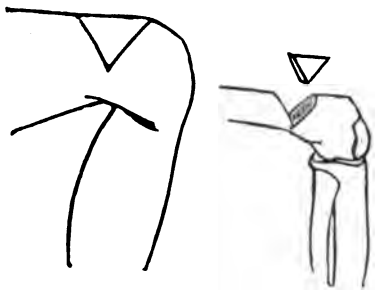
By gentle manipulation the remainder of the bone was cautiously broken through, when the limb was brought to its proper line, and put upon a splint with suitable dressings.

If it is decided to attempt the re-establishment of mobility, passive motion should be instituted, at a time to be determined in each case by the judgment of the surgeon. But it would be better to be satisfied with solid union, with the thigh in a favorable posture, than to risk anything in trying to make a new joint.

Barton's patient is said to have lost his power of moving the limb at the seat of operation, within a few years.

Resection of the femur in its continuity has been done, where the knee was anchylosed in the bent position, in order to enable the patient to walk; a wedge-shaped piece being sawed out as seen in Fig. 415. The mode of doing this needs no further explanation, as the method of performing this operation is explained on page 78, vol. 2; it may, however, be said that the division should not be completed with the saw, but by gentle extension so as to gradually overcome the resistance of the posterior part of the bone. After the operation is over, and the limb straightened as nearly as desired, a trough-shaped posterior splint should be used, to maintain the parts as much as possible at absolute rest until union is accomplished.

Fig. 415.



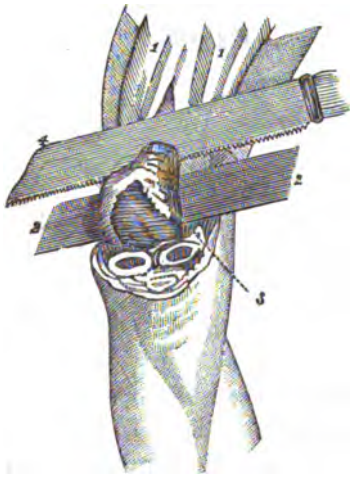
Knee Joint.—Excision of the knee joint may be required in cases of chronic disease of that articulation, and may be occasionally justifiable in cases of compound fracture or dislocation, or of angular anchylosis. This operation appears to have been first performed by Filkin, of Norwich, in 1762 (the case terminating in recovery), and was again successfully done by Park, in 1781. So little favor, however, did the procedure meet with in the eyes of surgeons generally, that thirty years ago it had been performed in all but twenty times. Revived by Textor, in Germany, and by Fergusson, in England (the last-named sur-

geon operating for the first time in 1850), it has since been resorted to so frequently, that its statistics are now more extensive that those of any other excision.

Resection of the Knee Joint.*—This operation may be had recourse to in cases of disease of the knee, where the alternative is amputation. With the question of the choice between these two procedures we cannot here deal.

Operation.—The patient must be thoroughly etherized, and laid upon his back on a firm table. An incision is then made, either (as in Fig. 416) directly across the joint, on a level with the head of the tibia; or in a curved line with the convexity downward, and terminating on each side just behind the femoral condyles; or by making two lateral incisions united at their lower extremities by a transverse one. Of these methods, unless sinuses exist which may be otherwise followed with advantage, the second is preferable.

Fig. 416.



RESECTION OF THE LOWER THIRD OF FEMUR AT THE KNEE-JOINT.—1, 1, the anterior muscles of the thigh. 2, 2, wooden spatula under the bone. 3, extremity of femur—tuberosities. 4, saw cutting through the bone.

The joint being exposed, the crucial ligaments are divided, and the end of the femur tilted out. A thin slip of wood is then placed behind it, and the soft parts held out of the way by means of a retractor, when as much of the bone as is thought needful is sawed off. Any form of saw may be used. Next the head of the tibia is in like manner removed. The patella is always to be dissected out, as its retention is not only useless but harmful. (In the figure, the femur is represented as sawed through above the limit of the epiphysis; this is especially objectionable in all cases where the bone has not attained its full

*See Excision of the Knee Joint, vol. 1, p. 715.

growth, since the limb will inevitably be much shorter than its fellow, and hence its usefulness in walking will be much lessened.)

After the operation, the limb must be placed on a firm and well-made splint. An opening may be left opposite the joint, a strong, curved iron bar, shaped so as to allow access to the part for dressing, being securely screwed to the upper and lower portions on either side. The wound should be closed with sutures, and dressed with cold or warm *Staphysagria* water, or a lotion containing a small proportion (about one part to thirty) of *Carbolic acid*.

Bones of the Leg.—Resection of the *tibia* is rarely justifiable, but may occasionally be proper in cases of acute necrosis from subperiosteal abscess. The operation requires a single longitudinal incision, the bone being then divided with a chain saw, and wrenched from its epiphyseal attachments with the lion-jawed forceps. Resection of the *fibula*, which may be required for compound fracture or for necrosis, may be effected by a similar operation, care being taken to prevent subsequent eversion of the foot, by the use of a suitable splint.

Ankle.—Resection of the ankle joint may be required for compound fracture or dislocation, or for disease of the articulation. The operation may be performed by means of two lateral incisions, Fig. 417, one behind either malleolus, or, by means of a semilunar incision passing around the lower border of the external malleolus and continued in a longitudinal direction along the line of the fibula. The anterior portion of the incision should not extend so far as to endanger either the extensor tendons or the dorsal artery of the foot. Having divided the peroneal tendons,

Fig. 417.

RESECTION OF LOWER THIRD OF TIBIA.—1, and 3, instruments in position. 2, wooden spatula below the bone.

the surgeon may remove the lower end of the fibula, when the astragalus will come into view. If this bone be very slightly affected, it may be sufficient to gouge away such parts as are diseased, but under ordinary circumstances it should be removed entire. The foot being then inverted, the lower end of the tibia is to be cautiously cleared with the probe-pointed knife, the inner malleolus being cut away with strong forceps, and as much of the articulating extremity of the tibia as may be thought necessary, removed with the chain-saw. The limb should be kept during the after-treatment in a fracture-box, or on a posterior carved splint provided with a foot-piece. The foot must be well supported, lest anchylosis with a "pointed toe" ensue.

The *statistics* of excision of the ankle joint have been particularly investigated by E. Spillman, who has collected 78 cases, in 22 of which the fibula alone was involved, while in the other 51 the tibia was likewise implicated. The disease, in most instances, was caries or arthritis, but occasionally necrosis, bony tumor, etc. The results may be seen in the following table:

Nature of operation.	Total.	Recovered.	Died.	Not terminated.	Subsequent amputation.	Mortality of terminated cases.
Excision of outer malleolus	22	15	4	2	1	20 pr. ct.
Excision of ankle.....	51	35	10	1	5	20 pr. ct.
Aggregate.....	73	50	14	3	6	20 pr. ct.

The condition of the preserved limb, in most of the cases of recovery, is said to have been quite satisfactory. Mr. Hancock, who has devoted special attention to the surgery of the foot and ankle, has collected 32 cases of this operation performed by British surgeons, to which may be added 5 others since reported by Erichsen, Mulvany, Holmes, and Murney, of Belfast. Of the 37 patients, 25 recovered with useful limbs, 7 died, and 2 submitted to amputation, while the result of 3 cases is not known. In every instance, the operation was a *complete excision*, the mortality of terminated cases being 20.6 per cent.

Foot.—The only resections of *tarsal bones* which require special notice are those of the *astragalus* and of the *calcaneum*.

Resection of the Astragalus may be required in cases of com-

pound fracture or dislocation (or even simple dislocation, if irreducible), caries, nocrosis, etc. The operation requires a semilunar incision on the anterior and outer aspect of the joint. The removal of the bone may often be facilitated by cutting across its neck with strong pliers, when the fragments may be successively dislodged with elevator and forceps, the probe-pointed knife being cautiously used in the deep portions of the wound—but in other cases it may be necessary to remove the bone piecemeal, by means of the gouge.

The *statistics* of this operation (which was first performed by Hildanus, in 1670) have been investigated by Hancock, who finds that of 109 patients, 76 recovered with useful limbs, 2 were cured by amputation, and 17 died, while in 14 cases, the result was not ascertained. The mortality of terminated cases was thus nearly 18 per cent.

SECTION V.

RESECTIONS IN THE CONTINUITY OF BONES.

These operations, as already mentioned, are sometimes rendered necessary by angular deformity after fractures. Another class of cases requiring them may now be spoken of, viz., those of necrosis or death of part of a bone or bones. This may be due to blows, gunshot wounds, or other violence locally applied, or may occur spontaneously, as for example after typhoid fever. A case of this kind, in which there was exfoliation of several large pieces of the tibia and fibula of one leg, in a boy eight years of age, was recently under the care of Dr. Packard at the Episcopal Hospital. The presence of the *sequestrum* or dead portion keeps up a constant irritation, as any other foreign body would, and matter, generally thin and ill-formed, flows through fistulous orifices in the skin. Sometimes these openings are at a distance from the actual seat of trouble, with which they communicate by sinuses, often irregular and tortuous in their course.

As a general rule, resections for necrosis should only be instituted after the necrosed portions are felt to be quite loose; since if violence is used in removing them, the injury done to the adjoining bony structure may cause it also to lose its vitality,

or to become inflamed. Sometimes the sequestra are small and accessible, and may be readily picked out by grasping them with a strong pair of bone-forceps. Thus in cases of necrosis of the end of a bone after amputation, when the sequestrum has a honeycomb appearance, we have only to wait until the separation is complete, and by getting hold of the end, one blade of the forceps being passed into the central cavity, we can gently extract the dead portion entire. Furgusson's lion-jawed forceps will sometimes prove very useful for this purpose.

When the necrosed fragment is part of the wall of the bone, even if it be quite long, it may lie superficially, and be readily lifted or coaxed out, perhaps without even enlarging the openings in the skin.

But sometimes the sequestrum is surrounded by a deposit of new bone, forming a cavity or *cloaca*, with one or more orifices, too small to allow of the extraction of the dead mass.

When this is the case, we may sometimes, by means of a chisel, or cutting-forceps, enlarge the openings, laying two or more of them in one, until the sequestrum can be removed. Or it may be necessary to make a new opening, by applying the trephine at one or more points, and then using the chisel as before.

In operations of this kind, the gouge-forceps, are often extremely useful.

After such procedures, the limb is to be placed at entire rest, and cold or warm *Calendula* water dressings applied. The cavity left fills up by granulation, the skin contracts and becomes more or less adherent, and after a time the parts are restored in a great degree to their normal state.

Subperiosteal Resection.—This plan—taking away diseased or dead bone without removing the periosteum—has of late years been much increased in importance by the researches of Ollier and others on the bone-forming power of that membrane.

General directions for it can scarcely be given. The periosteum should, however, be laid open only to such an extent as may enable us to get an elevator under the diseased bone, or if needful a chain-saw to divide it, when it can be pried or drawn out.

Gouging.—This operation, for the removal of carious bone, has been a favorite one with some surgeons; but it may well be questioned whether the diseased and softened portions would not have been as completely and more safely separated along with the discharges from the wound, without interference.

Should the procedure be determined upon, it may be carried out either with the gouge-forceps or with chisels. The less violence done to the neighboring textures the better. The after-treatment is the same as in cases of necrosis.

CHAPTER XI.

AMPUTATIONS.

SECTION I.

HISTORY AND GENERAL CONSIDERATIONS.

It is often said, by unreflecting persons, that amputation is the opprobrium of surgery, and indeed the proposal to cut off a limb must be considered as an acknowledgment of failure on the part of the surgeon to effect a cure in any other way. But when we consider than an amputation is never done except with a view of saving life, which is more or less endangered, or to remove what is no longer of service, but a mere useless and troublesome appendage, it must be confessed that no operation can more truly deserve the name of conservative; "the humane operation" it was called by some of the older surgical writers, and it is probable that there is no other procedure in the whole range of operative surgery which has saved so many lives and obviated so much suffering as this.

The word "amputation," as now used, is generally understood to apply to the removal of a limb, though we still speak of amputating the penis, and some writers employ the term also for excis-

ion of the breast. A limb may be amputated through its bones or through its joints; the former operation is an amputation, in the *continuity* of the limb, or simply an amputation; the latter an amputation in the *contiguity*, a *disarticulation*, or an *exarticulation*.

History.—The ancients generally amputated merely through parts already dead, probably from fear of hemorrhage, to control which they had very imperfect if any means. It is probable, however, that Celsus, who lived at the beginning of the Christian era, was in the habit of amputating through living structures, and he also divided the bone at a higher level than the soft parts (thus anticipating in some degree the modern circular operation); he was acquainted with the use of the ligature, but whether or not he applied it to the vessels after amputation, is not quite certain. The use of a fillet to control the circulation, before amputating, is due to Archigenes, who, however, neglected the preliminary dissection of the soft parts, dividing the entire limb at the same level, and using a hot iron to arrest the bleeding. Until the latter part of the seventeenth century, there was little improvement upon these rude procedures; Pare had indeed introduced the ligature, but it was not generally adopted, and amputations were still done in essentially the same way that was prescribed by Galen and his followers. Many surgeons dreaded to cut through living parts at all, and others sought to prevent bleeding by the use of heated knives. The first tourniquet was introduced by Morel, in 1674, and a few years later an English surgeon, named Young, devised, apparently independently, a similar contrivance. These early tourniquets, consisted merely of a fillet twisted with a stick, very much, in fact, like the simple apparatus which is now known as the Spanish windlass. Morel's tourniquet was subsequently improved by the celebrated Petit, and the instrument which he devised is essentially that which is used at the present day. This illustrious Frenchman, and the English Cheselden, about the same time began to operate by a double incision, in which, however according to Velpeau, they were anticipated by Maggi (1552), cutting first the skin and subcutaneous fascia, and then the muscular tissue and bone at a higher level. Louis, on the other hand, returned

to Celsus's plan, and cut down at once to the bone, which he then divided higher up; he also employed digital pressure in place of the tourniquet, believing that the latter interfered with the retraction of the muscles. Amputation by means of a flap, cut from without inward, was introduced, or according to Velpeau, reintroduced, by Lowdham and Young, in England, and shortly afterward the formation of a flap by transfixion, by Verduin, of Amsterdam. The flap operation was subsequently improved by several other surgeons, and was finally adopted and brought into common use by the labors of Liston and Guthrie, in England, of Klein and Langenbeck in Germany, and of Dupuytren, Larrey, Roux, and some others in France. All the different methods of amputating may be considered as mere varieties of these two principal modes, the flap and the circular.

Conditions requiring Amputation.—The circumstances which may render amputation necessary are manifold. The following are enumerated as the principal conditions which are considered to indicate the removal of a limb.

When a limb is torn off by the action of machinery or carried away by a cannon ball, there can be no question as to the propriety of amputation. The operation may indeed be said to have been already done by the accident which caused the injury, and all that remains for the surgeon to do is to put the wound in such a condition as to promote its healing, and insure the formation of a well-shaped stump.

Mortification, when the gangrene is more extensive than a mere superficial slough, is usually a cause for amputation. The ordinary rule, and a very sound one under most circumstances, is that the surgeon should not operate until the line of separation is well established: thus, in the form of gangrene resulting from the intensity of the inflammatory process (as after frost-bite), no operation should be done while the mortification is still extending, but the surgeon should wait until nature herself indicates that the limit of the destructive process has been reached, and may then amputate at any convenient point above the line of separation. On the other hand, in the strictly local forms of gangrene resulting from direct injury, as in compound fractures, amputation should be performed as soon

as the signs of mortification are unequivocally manifested; delay will commonly cause the loss of the patient, before time has been afforded for the formation of any line of demarcation. There is another class of cases, principally met with in military practice, which often demands immediate amputation. This is where gangrene follows upon an arterial lesion at a distant point, as in mortification of the foot from a wound of the femoral artery. The gangrene, in such cases, first shows itself by a change in the color of the affected part, which is at first pale and tallowy, and subsequently becomes mottled and streaked; there is at first numbness, followed by insensibility of the mortified member. In such cases, Mr. Guthrie advises that while the gangrene remains limited to the toes, or foot, it is right to wait, in hopes that it will not pass further; but if it manifest a tendency to spread above the ankle, amputation should be at once performed at the point where experience shows that the morbid action is likely to cease, that is, a short distance below the knee. In a similar condition of the arm, amputation should be performed at the shoulder joint. With regard to the *dry gangrene* which attacks the extremities of old persons, it is generally advised to refrain from amputation altogether, from the fear that the morbid action would recur in the stump: and, indeed, the constitutional state of patients thus affected is usually so unfavorable for any operation, that the surgeon would naturally hesitate about proposing to amputate. It has, however, been suggested that as this senile gangrene, often, at least, depends on arterial obstruction, a better chance would be afforded by amputating high up in the thigh than by any other mode of treatment; and this plan has been actually put in practice by James, of Exeter, and some others, with favorable results. It is obvious, however, that the additional risk from the operation itself would be so great, that it could only be justifiable in exceptional cases.

Amputation is sometimes required in cases of *hospital gangrene*, either after the cessation of the process, on account of the extensive destruction of parts, or even during its progress, on account of profuse hemorrhage which may occur from the opening of a large artery.

Amputation is sometimes necessary to remedy the evils pro-

duced by exposure to *heat* or *cold*. In cases of frost-bite, if merely the fingers or toes are affected, it is better to allow the dead parts to be spontaneously separated, and to trim off the stump subsequently; if the mortification be more extensive, amputation may be done through the dead tissues (in order to remove a useless and offensive mass), and a second amputation be performed when the line of separation has been clearly established. In cases of burn or scald, it is proper to wait until the sloughs have spontaneously come away, and until the reparative power of nature has been fully tested, when, if it be found manifestly inadequate to the task, an amputation may be performed with the best prospects of a favorable result.

Compound fractures and luxations frequently render amputation necessary. The majority of primary amputations in civil hospitals are for these accidents, and the number of such cases which require removal of the limb is constantly becoming larger, with the extension of steam power, the multiplication of railroads and the consequent increase of travel.

Amputation is very often rendered necessary by *gunshot injuries*. Though so much has been done of late years to save limbs in military practice by the introduction of excision as a substitute for amputation, still the latter must always continue to be a frequent operation in the hands of the army surgeon; and, indeed, in no cases is it more truly the "humane operation" than in the frightful injuries which are produced by the missiles of warfare.

Various affections of the bones and joints require removal of the limb. The number of cases of this kind which are now submitted to amputation is happily gradually becoming more limited, thanks to the introduction of excision and to the modern improved methods of treating these affections without operation. Still, it is probable that there will always remain a certain number of cases, in which the destruction of tissue is so extensive that nothing short of amputation will avail to save life.

Amputation is required, in certain *lesions of arteries*; thus, if the popliteal artery be ruptured, amputation is almost always indicated. Again, certain traumatic aneurisms, or spontaneous aneurisms which have become diffuse, are more safely treated by amputation than in any other way.

Morbid growths, may render amputation imperative. Even non-malignant tumors may, from their size or other circumstances, call for removal of the affected limb, while malignant affections of the extremities, especially if the bones be involved, almost always demand amputation.

Tetanus has been considered a cause for amputation, and the operation has occasionally been followed by recovery from the disease. The experience of the profession has, however, shown that amputation cannot be regarded as a remedial measure under such circumstances, and few surgeons would now think it right to add the risks of a capital operation, when there is so little prospect of benefit accruing; if, however, amputation was in any case otherwise indicated, the occurrence of tetanus would be an additional reason for the performance of the operation.

Finally, amputation may be required for the relief of *deformity*, whether natural or acquired. These are operations of *complaisance*, and should therefore only be performed with such limitations as have been already referred to.

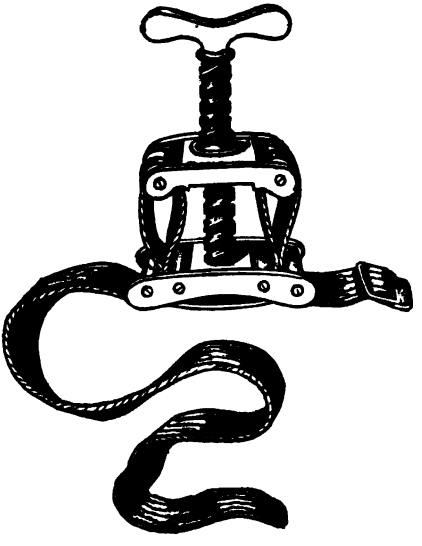
Instruments.—The instruments required for amputation are a tourniquet or other means of controlling the circulation, knives of various shapes and sizes, saws, bone-nippers, artery forceps and tenacula, ligatures, retractors, sutures and suture needles, and scissors.

Tourniquet.—The use of a tourniquet in amputation has been reprobated by some excellent surgeons, among others by the late Mr. Guthrie. The only objections to it are that it produces a certain amount of venous congestion, and that it may interfere with the muscular retraction which is desirable in the circular operation. But by taking care to elevate the limb before screwing up the tourniquet, and not to do the latter till the moment before making the incisions, the interference with the return of venous blood is so slight as to be unimportant, while the difficulty as regards the muscles can easily be obviated by retrenching the bone if necessary after the vessels have been secured, and the tourniquet removed. In fact, the evils of this instrument are more apparent than real, while its advantages are manifest and incontestable. Guthrie and Hennen speak of

compressing the artery with one hand while the amputation is done with the other, but such a course seems to me more adapted to show the skill and fearlessness of the surgeon than to promote the good of the patient; safety should never be sacrificed to brilliancy, and there can be no question that a well-applied tourniquet renders an amputation *safer* than the best directed manual pressure; for while the latter can only check the flow of blood through the main vessel, a tourniquet controls all the arteries at once, and it is often the smaller vessels that give the most trouble.

The best tourniquet for ordinary use is that known as Petit's,

Fig. 418.

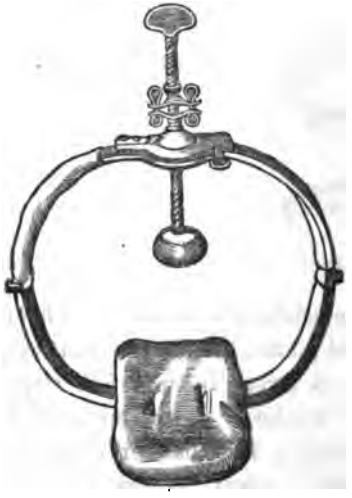


Petit's tourniquet.

from having been introduced by the celebrated French surgeon of that name. It consists of two metal plates, the distance between which is regulated by a screw, with a strong linen or silk strap provided with a buckle. It is thus applied: a few turns of a roller are passed around the limb, and a firm pad or compress thus secured immediately over the main artery. Upon this pad is placed the lower plate of the tourniquet so that the artery is

held between this plate and the bone, and the strap is buckled tightly enough to keep the instrument in place. When the surgeon is ready to make his incision, the screw is turned so as to separate the plates and thus tighten the strap till the arterial circulation is entirely checked. It is often said that, provided the compress is placed over the artery, it makes no difference to what part of the limb the tourniquet plate is applied; this is a mistake, and a moment's reflection will show that it is so; the mechanism of the tourniquet is such that it makes *direct* pressure at two points only, viz., immediately below the plate, and at a point diametrically opposite; at every other point of the circumference the pressure exerted by tightening the strap is *oblique* or gliding. Hence, unless the plate be immediately over the artery or diametrically opposite to it, the effect of turning the screw will be inevitable to push the vessel more or less to one side, and thus the circulation may not be controlled, though the instrument be applied as tightly as possible. Hence, as a rule, the tourniquet plate should go immediately over the artery: where this is not practicable, as in the case of the axilla or the popliteal space, it should be placed at a point diametrically opposite.

Fig. 419.



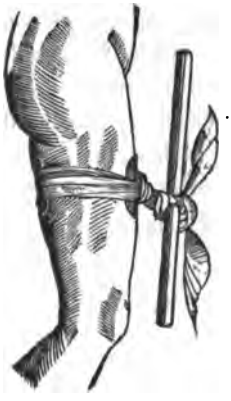
Signoroni's tourniquet.

Fig. 420.

Petit's tourniquet applied.

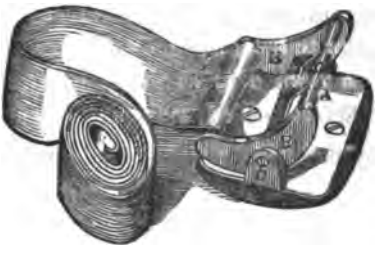
Various other forms of tourniquet have been devised, but none of them approach in value to that of Petit. The ordinary *field tourniquet*, as it is called, consists merely of a strap and buckle with a pad to go over the vessel, Fig. 422; it is no better

Fig. 421.



Spanish windlass.

Fig. 422.



Field tourniquet.

than the common *garrot*, or *Spanish windlass* (Fig. 421), made with a stick and handkerchief. Another form is the *horse-shoe* or *Signoroni's tourniquet*, (Fig. 419), and the various *artery compressors*, which are designed so as not to control the smaller vessels; however useful these may be for cases of aneurism or accidental hemorrhage, they are not, I think, as good as Petit's instrument for employment in ordinary amputations. In certain special operations, however, these are very valuable; thus hip-joint amputation is shorn of half its terrors by the use of Skey's tourniquet or Lister's aorta compressor.

Amputating Knives.—Formerly surgeons used for the circular operation a knife with but one edge and a very heavy back, shaped somewhat like a sickle; the modern amputating knives, however, which are adapted for either the circular or the flap operation, have a sharp point, and are usually double edged for an inch or two at the extremity. The length of the knife should be about one and a half times the diameter of the limb to be removed, and its breadth from three-eighths to three-quarters of an inch. Thus, a knife with a cutting edge eight or nine inches long will answer for most amputations of the thigh, while one

with an edge of six or seven inches will do for smaller limbs. *Double-edged catlins* are used principally for the leg and forearm, and are convenient in freeing the interosseous space for the application of the saw; their width should not exceed three-eighths of an inch. Besides the ordinary amputating knives, the surgeon should have at hand one or two strong scalpels or bistouries, about three inches long, while for smaller amputations, as of the fingers, a very slender knife with a heavy back will be found convenient. The blade of such a knife should be about two inches long and an eighth of an inch wide.

Scissors are used to cut the ligatures and sutures, or to retrench any projecting nerves, tendons, or masses of fascia.

SECTION II.

MODES OF AMPUTATING.

The various modes of amputating may be considered as mere modifications of the two original forms of the operation, the circular and the flap; thus the oval operation, or that of Scoutetten, is based upon the circular, while the different methods of Vermale, Sedillot, Teale, Lee, etc., are but varieties of the flap operation.

Circular Method.—An amputation by the circular method is thus performed: Anæsthesia having been induced, and the seat of operation washed and shaved, the patient is brought to the side or the foot of the operating table, so that the limb to be removed projects well over the edge. The circulation should be controlled by means of a tourniquet or by manual pressure exercised by an assistant, while another assistant holds the affected limb in such a position as is convenient for the operator. The latter should stand so that his *left* hand will be *toward* the patient's trunk; thus, in amputating the *right* leg, the surgeon stands on the patient's right side, while in removing the *left* leg he stands *between* the patient's limbs. The surgeon then, steadying and drawing upward the skin with his left hand, slightly stoops, and carries his right hand, which holds a knife of sufficient length, around the patient's limb, so that the back of the knife is toward

his own face. Fig. 423. Pressing the heel of the knife well into the flesh, he makes a circular sweep around the limb, rising

Fig. 423.

Circular amputation of the arm.

as he does so, and thus being enabled to complete the whole or at least the greater part of the cutaneous incision with one motion; a few light touches of the knife will now allow considerable retraction of the skin, and, if the limb be slender, this degree of retraction may be sufficient. The first incision must completely divide all the structures down to the muscles. If the skin have not retracted sufficiently, the surgeon now, either with the same knife or with an ordinary scalpel, rapidly dissects up a cuff of skin and fascia, about half as long as the limb is thick. In doing this, care must be taken to cut always *toward* the muscles; neglect of this rule will cause division of the cutaneous vessels and consequent sloughing of the part. Having done this, the operator grasps the cuff of skin with his left hand, and, with the large knife, makes another circular cut at the point of the cuff's reflection, through all the muscles and down to the bone. A wide gap is usually immediately produced by the retraction of the cut muscles; if it be not sufficient, however, the surgeon quickly separates the muscular structures from their periosteal attachments with the finger or the handle of a scalpel, pressing them back and thus cleaning the bone for the space of about two inches. If the limb contain two bones, the interosseous tissues must be divided with a double-edged knife or with the ordinary scalpel. The retractor being applied and firmly drawn upward,

the bone is now to be sawn at the highest point exposed. It is well first to divide the periosteum with a knife, and to use the saw lightly at first, so as to avoid splintering. The saw should be held vertically, and if two bones are to be divided, they should be sawn together. The assistant who holds the limb must exercise care to keep it in such a position as neither to interfere with the action of the saw nor to allow the bone to break before the section is completed. As soon as the limb is removed the surgeon secures the vessels, momentarily loosening the tourniquet, if necessary, that the gush of blood may indicate the position of the smaller arteries, and, when all bleeding is checked, proceeds to dress the stump. If any projecting spiculæ have been left by the saw, they must be removed with strong cutting-pliers, and any tendons or nerves that hang out from the stump should be cut short with sharp scissors. The skin cuff is then brought together with sutures, so as to convert the circular into a linear incision, its direction being horizontal, vertical, or oblique, according to fancy of the operator. It is well to apply a bandage with circular turns from above downward, to the stump, so as to prevent spasm or subsequent muscular retraction. Sometimes great difficulty is experienced in turning up the skin cuff, from the conical shape of the limb. In such cases the surgeon may slit the cuff at one or both sides, thus converting the procedure into a modified flap operation.

Flap Method.—Amputation by the flap method is susceptible of an almost infinite number of variations. Thus there may be only one flap, more commonly two, or even a larger number. The flaps may be cut antero-posteriorly, laterally, or obliquely; they may be made by transfixing the limb and cutting outward, or may be shaped from without inward, or one may be made by transfixion and the other from without. They may include the whole thickness of tissue down to the bone, or merely the skin and superficial fascia, or they may embrace the superficial muscles, while the deeper layer is divided circularly (Sedillot). Finally, they may have a curved outline, or they may be rectangular.

In practicing the ordinary double-flap amputation, the surgeon stands as for the circular amputation, and grasping and slightly lifting the tissue which is to form the flap, enters the point of

the long knife at the side nearest himself; then pushing it across and around the bone with a decided but cautious motion, and slightly raising the handle when the bone is passed, he brings the point out diametrically opposite its place of entrance. Fig. 424.

Fig. 424.

This cut represents the surgeon as standing on the inner side; it is, however, more convenient on the whole that he should stand on the outer side. The knife should be carried along close to the bone for an inch or more before it is made to cut the flap. Mr. Haynes Walton says that it is better to make the lower flap first, since thus, the integuments being relaxed, it is easier to shape out the upper flap accurately.

Holding the blade in the axis of the limb, he then shapes his flap by cutting at first downward with a rapid sawing motion, and then obliquely forward. Turning up the flap, he re-enters the knife at the same point as before, carries it on the other side of the bone, brings it out with the same precautions as at first, and cuts his second flap. He then applies the retractor, makes a circular sweep to divide any remaining fibres, and saws the bone as in the circular operation. In many situations, as in the front of the leg where the bone is superficial, it is impossible to make a flap by transfixion, and in any part, if the limb be large, the flap thus made is unwieldy, the skin retracting more than the muscles, which project and interfere with the closure of the wound. Hence it is often better to make at least one flap by cutting from without inward, dividing the skin and superficial fascia by the first incision, and the muscles by a second, at a higher point.

In view of the wasting and gradual disappearance of muscular tissue, which always takes place in a stump, some surgeons think to save time and trouble by making flaps of skin only; but apart

from the danger of sloughing, which always attends these long skin flaps, unsupported by muscle, the resulting stump is not so serviceable, for though the true muscular structure does indeed disappear, the fibrous sheath of the muscle remains, becoming condensed into a thick pad which forms a very necessary covering for the bone.

In making antero-posterior flaps by transfixion, the anterior one should be cut first; if the flaps are shaped from without inward, the lower should be formed first, as otherwise the blood from the first incision would obscure the line of the second. In making lateral flaps, the outer should be the first cut, and, generally, it may be stated that that flap should be first formed which does *not* contain the principal artery.

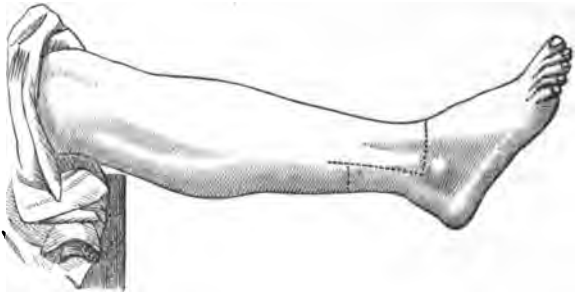
Oval Method.—The oval amputation in its simplest form may be considered as a circular operation, in which the cuff of skin has been slit at one side, and the angles rounded off. In this form it is used for disarticulation at the metacarpo-phalangeal joints, and, with a slight modification, constitutes Larrey's well-known method of amputating at the shoulder joint. Another form of the oval operation, which in this case should rather be called elliptical, is particularly adapted to the knee and elbow joint, though it is applied by the French to other parts as well. The incision in this form of amputation constitutes a perfect ellipse, coming below the joint on the front or outside of the limb; the resulting flap is folded upon itself, making a curved cicatrix and furnishing an excellent curving for the stump.

Modified Circular Operation.—This plan seems to have been independently suggested about the same time, by Mr. Liston and Mr. Syme. It may be regarded as the ordinary circular operation, with the skin cuff slit on both sides and the angles trimmed off. It is done by cutting with a suitable knife two short curved skin-flaps, and dividing the muscles with a circular sweep of the instrument: it is particularly adapted to amputations through very muscular limbs.

Teale's Method by Rectangular Flaps.—This operation, which was introduced and systematized by Mr. Teale, of Leeds, about fifteen years ago, undoubtedly furnishes a most elegant and serviceable stump. There are two flaps of unequal length,

the shorter always containing the main vessel or vessels of the limb. Fig. 425. The flaps are of equal width, but while one

Fig. 425.



Flaps in Teale's amputation.

has a length of *half the circumference* of the limb at the point where the saw is to be applied, the other is but *one-quarter as long* (i. e. *one-eighth* of the circumference). The lines of the flaps should be marked with ink or crayon before beginning the operation, as otherwise, especially in dealing with a conical limb, it is almost impossible to cut the long flap of the requisite rectangular shape. Both flaps are to embrace all the tissues down to the bone, and the long flap, which is in shape a perfect square, is, after sawing the bone, folded on itself, and attached by points of suture to the short flap. The advantages of this mode of amputating are that it secures a good cushion of soft parts over the end of the stump, and that the resulting cicatrix is entirely withdrawn from the line of pressure, in adapting an artificial limb: its disadvantage is that if used upon a muscular limb, it requires the bone to be divided at a much higher point than would otherwise be necessary, and thus, in the case of the thigh at least, adds much to the gravity of the operation. Hence, it has been suggested by Prof. Lister, to alter the relative dimensions of the flaps, making the longer of just sufficient size to bring the cicatrix out of the line of pressure, while its diminished length is compensated for by increasing that of the short flap.

General Rules.—As much length of the limb should be saved as possible. The nearer the body, the greater the danger; and in these days of artificial substitutes, even a small portion of the forearm or leg may be made very useful.

An ample sufficiency of skin to cover the bone must always be secured. Some surgical writers think that muscular and areolar tissue in a flap are useless, being absorbed; but an examination of many stumps is sufficiently convincing that this is an error; it is far better to have plenty of substance.

The incisions should be so made as to bring the cicatrix where it will be subjected to the least possible pressure when the stump comes to be used.

Nerve trunks must be cut off short, and never tied if this can be avoided.

All bleeding must be completely arrested before the wound is closed.

Appliances.—A good firm operating-table is very important. Few beds are high enough or firm enough. Often a kitchen ironing-table, with a mattress on it, will be available in private cases.

To *prevent* hemorrhage, a tourniquet should be used. It is perhaps more showy, but is certainly more dangerous, to trust to pressure by the fingers of an assistant.

To *divide the bone*, an ordinary amputating saw like a carpenter's panel saw is the best. Bow-saws are liked by some surgeons, but are more apt to break. Bone-nippers should be provided to cut away any splinters left by the giving way of the bone before it is entirely sawed through.

To *secure the vessels*, one or two tenacula, artery forceps, and ligatures, or if preferred, the apparatus for acupressure, will be needed. Styptics are often useful to arrest oozing; or a piece of ice, or a stream of cold water, may be used. Sometimes mere exposure to the air for a few minutes will suffice.

Sutures and needles, adhesive strips, and materials for dressing, sponges, hot and cold water, are of course necessary.

Dressings.—After amputation, the wound is closed by bringing the opposite edges of the skin together. The ends of the ligatures are brought outside, sometimes all at one end of the wound, sometimes in two or more bundles at different points, as the case may be, and a sufficient number of points of the interrupted suture, either silk or metallic, are applied to keep the edges in close apposition. It is always well, and especially

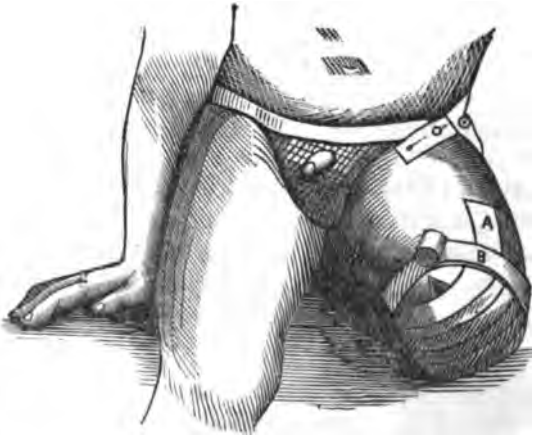
in large limbs, where the flaps are heavy, to reinforce the sutures by a sufficient number of adhesive strips, placed at suitable intervals, and long enough to take a firm hold. Fig. 426.

When a patient has to be moved soon after the operation, as in military surgery, the stump should be surrounded with a piece of old stuff spread with cerate, placed in a bed of charpie or other soft material, and a recurrent bandage (Fig. 427) well applied over all.

Fig. 426.

Dressing of the stump by adhesive strips.

Fig. 427.



A, adhesive strip; B, recurrent roller.

Some surgeons, among them Mr. Teale, of Leeds, England, use no dressings, but leave the stump exposed, resting on a pillow. Simple and non-cumbrous dressings, thoroughly protecting the part from the air, are the best; such as a solution of *Gossypium* or *Staphysagria*, one part to from fifteen to thirty of water, applied by saturating an old towel with it, and making of this a triangular cap for the stump, as recommended in Mayor's System of Bandages, vol. 1, p. 123.

Should no bleeding occur, and the stump remain comfortable, there is no need for removing the dressings for several days, unless they become disordered. An assistant is always needed to carefully raise the stump with both hands while the old dressings, previously loosened, are taken off, and new ones applied.

As soon as suppuration is established, the dressings should be changed daily, and *Calendula* lotions be substituted for the previous applications. Very gentle traction may be made on the smaller ligatures at about the tenth day, should they not come away earlier of themselves.

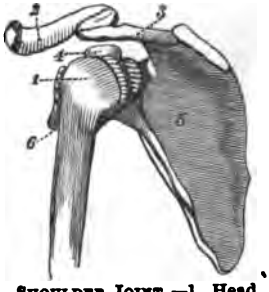
With the dangers of these cases—pyæmia, sloughing, tetanus, osteo-myelitis, necrosis, deformity of stump, neuralgia—we cannot now concern ourselves. Secondary hemorrhage ought not to occur; when it does, good surgery demands the opening of the stump and the securing of the bleeding vessel, or the application of a tourniquet, according to circumstances.

SECTION III.

AMPUTATIONS OF THE UPPER EXTREMITY.

Amputation (Disarticulation) at the Shoulder Joint.* —Formidable as it is in appearance, the statistics of this operation are encouraging. To perform this operation creditably it is necessary that the surgeon should have a knowledge of the surgical anatomy of this joint.

Fig. 428.



SHOULDER JOINT.—1. Head of humerus; 2. Clavicle; 3. Acromion process; 4, Coracoid process; 5. Dorsum of Scapula; 6 Insertion of pectoralis major.

Surgical Anatomy.—The head of the humerus is spheroidal, and much larger than the shaft, to which it is set on at an angle. Fig. 428 shows the upper part of the bone in its outer and somewhat posterior aspect. The same figure shows the bone in its relation with the scapula and clavicle.

The acromion projects out over the glenoid cavity, curving sharply forward to articulate with the

* See Amputation at the Shoulder Joint, vol. 1, p. 708.

clavicle; the coracoid runs out just above and in front, and then turns outward.

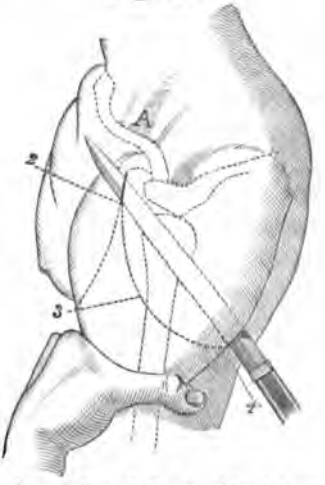
Hemorrhage is to be prevented by pressure, made either with the fingers of an assistant, or with the wrapped handle of a door-key, upon the subclavian as it passes over the first rib.

In all the methods of operating, the portion of the flap containing the artery is cut *last*, and the surgeon or an assistant instantly grasps and secures the vessel.

Operation.—Lisfranc's method, by transfixion, is shown in Fig. 429.

On the left side, the surgeon standing on the outer side of the limb, the transfixion is made from the posterior fold of the axilla so close to the acromion, that the knife just grazes the humerus. The knife having cut its way out, and the flap, thus made, 2, 3, 4, being raised, the joint is opened, the head of the bone tilted outward, the knife passed behind it, and the inner flap made as seen in the figure. On the right side, the transfixion for the posterior flap is in like manner made first, but the surgeon stands at the inner side, and the knife goes from close to the acromion backward to the fold of the axilla.

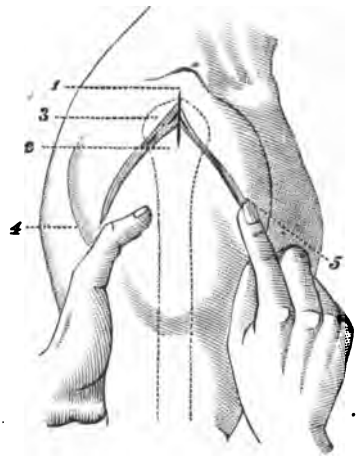
Fig. 429.



Amputation at the shoulder joint—catlin making the first flap. 2, 3 and 4, anterior flap; A, clavicle.

Larrey's Method.—The surgeon enters the point of a sharp knife below and a little in front of the acromion process, and makes a deep incision about three inches long in the direction of the axis of the arm. From the middle of this incision two others are made obliquely downward (and slightly convex, if the limb be muscular), so as respectively to terminate at the points where the anterior and posterior folds of the axilla end in the tissues of the arm. Fig. 430. It is usually directed that the anterior incision should be made first, as the posterior circumflex artery is larger than the anterior, but if the subclavian be well commanded

Fig. 430.



1 and 2, first perpendicular incision; 3, head of humerus; 4 and 5, posterior and anterior incision.

over the first rib, there need be no fear of hemorrhage, and it will then be most convenient to make the posterior incision first, that its position may not be obscured by bleeding from the other. The surgeon next disarticulates, rotating the arm first outward so as to make tense the subscapular muscle, which he divides with a perpendicular stroke of the knife, then cutting the capsule and the tendon of the long head of the biceps, and finally rotating the arm inward so as to reach the supra- and infra-spinatus muscles, and the teres minor. The lateral incisions are lastly connected by a transverse cut through the tissues of the arm, either from without or from within. Before this final incision (which divides the brachial artery) is made, an assistant should slip his thumb into the wound and control the vessel, which may always be found in the first muscular interspace from the anterior edge of the axilla; the limb being removed, the vessels are to be secured, and the edges of the wound brought together so as to make a linear cicatrix.

Dupuytren's Method.—This method consists in making, either by transfixion or from without inward, a large flap, embracing almost the whole of the deltoid muscle, then disarticulating, and finally cutting a short flap (in which is the vessel) from the inside of the arm. This operation is more quickly performed than Larrey's, but makes a larger wound, and is not, I think, so generally applicable. In either method the principal difficulty is in disarticulating, to accomplish which (in the case of fracture preventing the use of the arm as a lever in effecting rotation) it may be necessary to introduce the forefinger of the left hand into the capsule, and forcibly drag down the head of the bone so as to expose the ligamentous attachments. In making the deltoid flap by transfixion, the knife should be entered

about an inch in front of the acromion process, and being pushed directly across the joint and capsule, should be brought out at the posterior fold of the axilla. As in Larrey's operation, an assistant should slip his thumb into the wound, and secure he artery, before the final incision is made.

Amputation above the Shoulder, or amputation of the arm with a part or the whole of the scapula, and perhaps a portion of the clavicle, is occasionally required in cases of accident or of disease. No special rules can be given for the performance of this operation, to which, whenever possible, excision of the parts concerned is to be preferred. In cases of injury, the surgeon must make his flaps as best he may, in view of the extent and direction of the laceration, and in cases of amputation for tumors, etc., must be guided by the size and shape of the morbid growth. The results of this operation have been more favorable than might have been anticipated; twelve recorded cases in which the arm and a part or the whole of the scapula were torn off by accidental violence, all terminated favorably, while seventeen cases in which the arm and part or all of the scapula, with or without a portion of the clavicle, were removed by the surgeon at the same operation, gave twelve recoveries and only five deaths.

Amputation of the Arm.—This is one of the simplest and easiest operations in surgery.

In the circular method, the skin is drawn upward after division, and the muscles cut by successive circular sweeps with the knife. In the double-flap method the catlin is introduced and the flaps made, as shown in Fig. 425, p. 779.

A tourniquet should in either case be used to prevent the loss of blood.

It is in the arm and thigh that the want of bulk in the flaps is most likely to give trouble; that unpleasant result, a conical stump, being very apt to occur here.

Amputation through the Arm.—The arm may be removed at any part and by any of the methods which have been described; those which seem to me the best are the oval and the modified circular. The bone, however, is situated so nearly in the middle of the limb, that an elegant and useful stump may be formed by any operation, and indeed the arm is frequently indicated as the

typical locality for making double flaps by transfixion. If this operation be resorted to, lateral flaps are the best, and the outer should be cut first; the principal precaution to be taken is to divide the musculo-spiral nerve with a clean sweep of the knife around the back of the bone, before applying the saw. In amputating the arm, the possibility of a high division of the main artery must be remembered; occasionally the brachial will be the only vessel that requires ligature, though usually there will be bleeding from six or seven, or, if the parts have been long inflamed, twelve or fifteen. If the arm be amputated very high up, particularly if the limb be muscular, there may not be room for the application of the tourniquet in the usual place; it may then be safely applied to the axillary artery, the arm being kept extended, so as to make the head of the humerus project into the axilla, where it forms a firm point of resistance against which to exercise pressure, or the surgeon may, if he prefer, have the subclavian artery compressed as it passes over the first rib, by means of a wrapped key in the hands of an assistant.

In Teale's method as applied to the arm, the long flap is to be made one-half the circumference of the limb, in its outer surface, and the short flap one-eighth. The upper flap is drawn over the bone and twisted backward until the two flaps come together. They may be united by wire sutures, and the stump either dressed in the ordinary method, with *Staphysagria* or *Gossypium* water, or left exposed to the air, resting on a pillow, as advised by Teale.

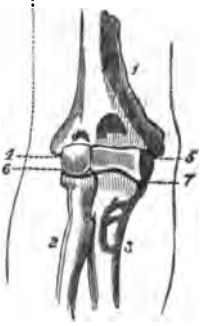
Amputation (Disarticulation) at the Elbow.*—This operation is not often done, but may be effected by either the circular or elliptical incision; it may also be done, though less conveniently, by making an anterior flap by transfixion. It is sometimes recommended to leave the olecranon in place, dividing the ulna below it with a saw; no particular advantage, however, attends this plan, and the olecranon, if left, is apt to become necrosed, and interfere with the healing of the stump. Amputation at the elbow was done in nineteen cases during the late war, and was uniformly successful.

Surgical Anatomy.—The bones entering into the composi-

* See Amputations at the Elbow Joint, vol. 1, p. 711

tion of the elbow joint are (Fig. 431): the humerus, the radius, and the ulna.

Fig. 431.



1, lower end of humerus; 2, radius; 3, ulna; 4, 5, 6, 7, openings of joint.

The figure shows the joint in its anterior aspect. 1, the humerus; 2, the radius; 3, the ulna; 4, 5, the lower margins of the condyles of the humerus; 6, 7, the line of the articulation.

Operation.—This may be done by either the circular or the flap method.

The *circular* method. The surgeon, standing on the inner side for the right, and on the outer side for the left arm, grasps the forearm with his left hand, and makes a circular cut through the skin and fascia about four fingers' breadth below the condyles of the humerus, the elbow being flexed at a right angle. Drawing the divided tissues well up, he now caries the knife around in the same manner down to the bone. By a third cut the biceps tendon, brachialis anticus muscle, and ligaments of the joint are divided. Lastly, either the olecranon is sawed through at its base, or its fibrous attachments to the humerus are cut through.

Fig. 432.

Amputation at the elbow joint. 1, and 2, lower end of humerus.

The rest of the operation, the securing of the vessels, etc., is done as usual. Fig. 432 represents this procedure, except that the skin flap is, as advised by Velpeau, turned up like a cuff, 1, 2. It is better to merely retract it, as above directed.

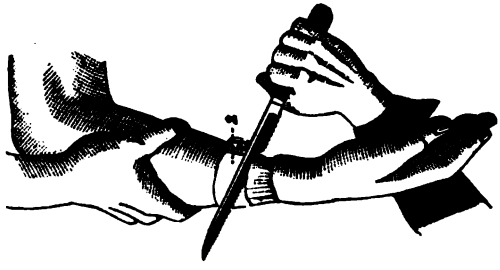
The *flap* method. Standing on the inner side of the limb, the surgeon directs an assistant to supinate the hand and to flex the elbow to about 135 deg. Grasping the tissues in front of the joint with his left hand, he now enters a narow double-edged knife, about an inch below the inner condyle of the humerus, and pushes it across, grazing the bones, so as to make the point emerge about two inches below

the outer condyle. The tissues thus transfixed, the knife is made to cut its way out, so as to form a flap about three inches in length. Next, the posterior division is made across the base of olecranon, the anterior flap raised, the joint opened in front, the ligaments and the triceps tendon cut, and the operation is complete.

The dressing of the stump thus made is done in the usual way, and as heretofore recommended.

Amputation through the Forearm.*—This may be done by the *circular* method, as shown in Fig. 434. The surgeon

Fig. 434.



Circular amputation in lower third of the forearm. 2, the lower flap turned over like a coat sleeve.

may stand on the outer side of the right limb, and on the inner side of the left, so as to have his own left hand to turn back the skin. After the skin is turned back sufficiently, the soft parts being divided down to the bones, a retractor of three tails is applied (the middle tail being passed between the bones), and the saw is used. Care must be taken to apply the saw accurately to both bones at the same time.

Usually, at least three vessels have to be secured.

The *flap* method. Generally speaking, it is better to make a long posterior flap, and a short anterior one. Teale's plan answers very well here; complete healing of such stumps has taken place within twenty days. Here, as in the leg, in making the incisions, the long flap should be somewhat wider than the short one.

The hand being semiprone (the thumb upward), the surgeon stands on the inner side of the left limb and on the outer side of the right, and with either a large scalpel or a small amputating

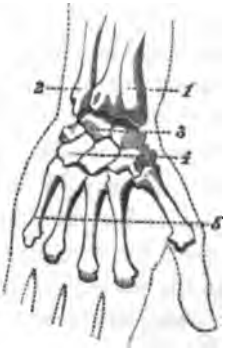
* See Amputation of Forearm, vol. 1, p. 712.

knife makes an incision from three to five inches long (according to the size of the limb), parallel with the palmar edge of the radius and about half an inch from it. Next, carrying the knife transversely across the back of the limb, the outline of the flap is completed by a similar incision parallel to the ulna and about half an inch from its palmar edge. This flap is now dissected up from the bone, so as to contain all the muscular tissue (not tendons) available; and then the short flap is made, beginning at about an inch from the point where the knife was first entered, and curving almost directly across to a corresponding point at the ulnar side, the tissues being dissected up as before. The corners of these flaps are rounded, not rectangular as in Teale's method. Both flaps are now retracted, the bones entirely cleared of soft parts, interosseous membrane, etc., and the saw applied. The remainder of the operation is done as in other cases.

When amputation is done low down in the forearm, it is of great importance to make the flaps of skin alone, drawing out the tendons, and cutting them off as short as possible.

Amputation (disarticulation) at the Wrist Joint*—This operation is sometimes required for injury, but more commonly for disease, of the hand. It may be done either by the circular or by the flap method.

Fig. 435.



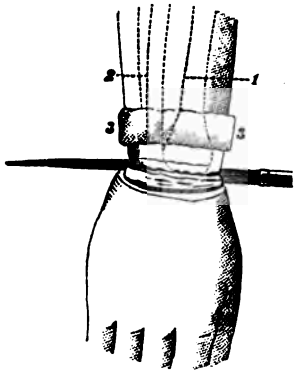
Anatomical appearance of the wrist joint. 1, radius. 2, ulna. 3, first row of carpus. 4, second row of carpus. 5, metacarpi of the hand.

Surgical Anatomy.—The lower extremities of the radius and ulna (1, 2, Fig. 435), with the intervening cartilage, form a somewhat crescentic depression, into which is received the upper row, 3, of carpal bones. With the latter are joined the second row, 4, of carpal bones, and with these again the metacarpals, 5. The mobility of the wrist belongs exclusively to the radio-carpal articulation, and it is through this joint that the operation is best done, as the small bones of the wrist are very apt to become necrosed if left.

* See Amputation at the Wrist Joint, vol. 1, p. 112.

Operation.—*Circular.* (Fig. 436.) The vessels being commanded by a tourniquet over the brachial, a small amputating knife is swept around the base of the hand, a full inch below the styloid process of the radius; the skin and superficial fascia being thus divided, are dissected up and turned back. The hand being drawn into adduction, the joint is opened from the radial side, the dorsal tendons and ligaments made tense and divided, the ulnar lateral ligament cut through, and the palmar tendons drawn down so as to cut them as high up as possible. The vessels are then secured and the wound dressed as usual.

Fig. 436.



Circular amputation at the wrist joint. 1, radius. 2, ulna. 3, 3, upper flap turned over like a coat sleeve.

Flap. A slightly curved incision, its convexity downward, is to be made from close to the tip of one styloid process to the other, over the back of the wrist. The joint is now opened, and the lateral ligaments divided; when by flexing the hand strongly, the knife may be passed between the radius and the first row of carpal bones, and the palmar fibrous tissues cut through. The palmar flap is now marked out and dissected up, full two inches in length, and well rounded at the corners; it should consist of skin and superficial fascia only.

This flap may, by an expert operator, be cut from within outward, but care must be taken lest the irregularities of thickness in the palm give rise to defects in its shape.

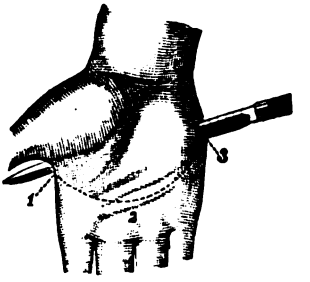
Amputation (disarticulation) of the Metacarpus.*—Sometimes, in cases of injury especially, it is highly desirable to save the thumb, although the rest of the hand must be sacrificed.

Operation.—The hand being strongly supinated, a narrow double-edged knife is inserted a little below the joint between the unciform bone and the fifth metacarpal, passed across the

* See Amputation of the Metacarpus, vol. 1, p. 713.

palm close to the bones, and made to emerge just below the joint between the trapezium and the second metacarpal. It is now carried downward parallel with the bones, and made to cut its way out, forming a large elliptical palmar flap, Fig. 437. Next, the hand being strongly pronated, a semilunar incision is made across the back of the hand, as in Fig. 438, about one inch below the carpo-metacarpal joint; and this flap being dissected up and turned back, the fibrous attachments of the metacarpus are all divided.

Fig. 437.

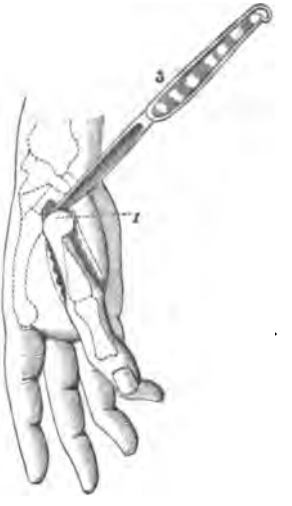


Amputation of the hand. 1, 2, 3, anterior flap.

Fig. 438.

Partial amputation of the hand.

Fig. 439.



Amputation at the carpo-phalangeal articulation of the thumb. 1, tuberosity or head of the metacarpus; 3, knife dividing soft structures.

Disarticulation of the Thumb.—In Fig. 439, the line of incision is shown, beginning near the upper end of the metacarpal bone, and sweeping round in an oval direction so as to come just below the metacarpo-phalangeal joint. The soft parts of

the angle of the wound so made are dissected up, and the head of the metacarpal bone turned out as in the figure; when by following it along closely, it may be altogether removed, with the thumb. The flaps must be brought together by sutures, and dressed as directed heretofore.

Disarticulation of all the Fingers at the Metacarpo-phalangeal Joint.*—The main point to be borne in mind is the relation between the heads of the metacarpal bones and the soft parts of which the flaps are to be made, viz.: that the line of the joints is about one inch above that of the webs between the fingers.

Operation.—The hand is steadied in the prone position, and the thumb held out of the way, by an assistant; the surgeon makes a semilunar dorsal incision, beginning outside of the metacarpo-phalangeal joint of the little finger in the right hand, or of the forefinger in the left, and going close to the roots of the fingers. Dissecting up the skin and superficial fascia, as far as the joints, he next divides the extensor tendons, flexes the fingers strongly, opens each joint, and by touches of the knife divides all the lateral ligaments. Now, getting the

Fig. 440.

Amputation at the metacarpo-phalangeal articulation of all the fingers. 1, 2, 3, anterior flap; 4, handle of knife making posterior flap.

blade of the knife, as in Fig. 440, across the line of the joints, he turns its edge forward, and makes it cut its way out so as to form the longest possible flap from the palmar tissues.

*See Amputation of the Hand and Fingers, vol. 1, p. 713.

Amputation through the metacarpus is done much in the same way, except that both flaps are first dissected up, and then, a five-tailed muslin retractor being applied to protect the soft parts, the saw is carried evenly across the bones so as to divide them all at the same time.

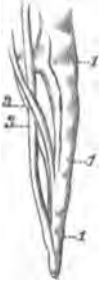
Amputation of the little finger is much like that of the thumb, before described. The incision is made along the metacarpal bone and around the base of the finger. The soft parts being stripped up, and retracted, the bone is sawed or nipped off.

Amputation (*disarticulation*) *of one finger* may be done by a double flap or by an oval method.

Double Flap method. The adjacent fingers being held aside, the surgeon carries an incision from over the head of the metacarpal bone downward, around the side of the finger to its palmar surface, and thence to a point corresponding to the one above. A second incision begins at the first about three-quarters of an inch from its commencement, passes around the other side of the finger, and falls into the first about three-quarters of an inch from its termination. The flaps thus described are dissected up, the joint exposed, and its fibrous surroundings divided.

Oval method. This is begun as in the manner just described; but when the knife reaches the side of the finger it is swept directly round its palmar surface, up on the other side, and backward on the dorsum to about half an inch from its point of commencement.

Fig. 441.



1, 1, 1, 2 and 3, show the splitting of the tendons and their attachment.

Disarticulation of Phalanges.—Fig. 441, shows the shape of the different articulating ends of the bones. 1, the metacarpal; 2, the first phalanx; 3, the second; 4, the third.

The figure also shows the relations of the flexor tendons; 1, 1, 1, the joints, 2, the flexor perforatus, going to the second phalanx, 3, the flexor perforans, going to the third.

Operation.—Usually a long flap is taken on the palmar surface of the finger. The finger is somewhat flexed, and the joint opened on the dorsum, then, the head of the phalanx being tilted up, the knife is turned,

keeping it very close to the bone, and made to cut a long flap, as broad as possible, from the palmar soft parts.

The reverse method of doing this, is to push a narrow knife through in front of the joint, to cut its way out and make the palmar flap; this latter being then reflected upward, the joint is opened and the dorsal soft parts divided.

SECTION IV.

AMPUTATIONS IN THE LOWER EXTREMITY.*

Amputation at the Hip Joint.—This, which may fairly be considered the gravest operation in the whole range of surgical practice, is a procedure of comparatively recent introduction. The first case which is usually classed as an amputation at the hip joint is that in which Lacroix (1748) removed the right thigh at the joint, on account of gangrene, which affected both limbs, and had been produced by the use of ergot. The amputation had been nearly completed by nature, and he merely divided with scissors the round ligament and the sciatic nerve. Four days later he amputated, through the line of separation, the left thigh at the trochanters: the patient, who was a boy of fourteen, survived the last operation for eleven days. Perault, in 1774, performed a somewhat similar operation, in a case of gangrene from external violence, the patient recovering. The first *bona fide* case of hip joint amputation through living parts was done by Kerr, of Northampton, about the same time, on a girl of eleven years, suffering from hip disease, complicated with psoas abscess and pulmonary phthisis; she died on the eighteenth day. The first case of this amputation for gunshot injury was Larrey's, in 1793, while the first successful case in military practice was that of Mr. Brownrigg, in 1812.

This very formidable operation has been so many times done with success in this country, as well as abroad, that it cannot but be regarded as among the legitimate resources of surgery, although the chances should be well weighed before it is decided upon.

* See article on Amputations at the Hip Joint and Lower Extremity, vol. 1, p. 718.

As performed for injury, it has been far less successful than as performed for disease. As a re-amputation (part of the limb having been removed before) it is deprived of much of its risk.

The chief danger is from shock, from the loss of so large a portion of the frame. Another, much more preventable, is that from loss of blood.

The patient should be abundantly but not excessively stimulated beforehand.

At the time of the operation, brandy, carbonate of ammonia (suspended in sweetened mucilage, 20 grains to a fluid half ounce), and other stimulants, should be at hand.

The temperature of the operating room should not be below 75 deg. Fahrenheit.

One assistant, thoroughly skilled and to depended upon, should take charge solely of the *control of the bleeding* (not of tying the vessels). If the aortic compressor (to be presently described) is used, he should adjust and regulate this; if not, he should compress the femoral artery against the brim of the pelvis, just below Poupart's ligament, and have no other thought or duty. Either the finger, or the handle of a large door-key, well wrapped, may be used to make the pressure.

Another assistant should be ready to secure and tie the vessels as soon as the flaps are made. The aortic compressor is composed of a padded plate, to be placed at the back of the patient, and upon which he lies. To this are attached two upright bars, with a sliding portion on each, fixed at any desired height by a small screw.

Passing across between the upper ends of these sliding portions is a bar, carrying an upright screw, with at its lower end a plate suitably padded. (This should be so arranged as to be moved only up or down, but not rotated, when the screw is turned.)

When properly applied, the lower pad is under the loins of the patient, and the upper one compresses the aorta against the bodies of the vertabræ, a little to the left of the median line; the mass of the intestines being pushed carefully over toward the right before the screw is turned and the pressure made, lest they be bruised by it.

Surgical Anatomy.—The femoral artery passes out from beneath Poupart's ligament, just in front of the joint. About two inches below its point of exit, it gives off the profunda. The direction and shape of the neck of the femur, its relation to the trochanters, and the form of the acetabulum, must be familiar to the surgeon by study on the dead body, if he would operate confidently, rapidly, and safely.

A branch of the internal iliac artery (which is therefore not controlled by pressure in the groin) accompanies the sciatic nerve. This, when aortic compression is not resorted to, must be secured as soon as possible after the incisions are completed.

Operation.—The surgeon stands on the outer side for either limb. The patient is brought to the very edge of a firm operating-table, his nates just clearing it.

Six reliable assistants are indispensable. One keeps the sound limb aside out of the way; he may also keep the genital organs well supported. One manages the limb to be removed. One controls the flow of blood, as before mentioned. Another sponges the wound, and secures the divided vessels, which it is better the surgeon himself should tie. One, accurately instructed as to the proposed steps of the operation, hands the instruments. One administers the anæsthetic and watches the pulse and respiration; he should be so experienced as to require no directions.

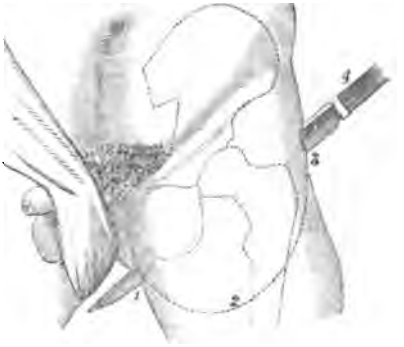
The operation may be done in various ways. In very thin subjects, the soft parts may be divided by cutting from without inward, down to the bone; but when there is any mass of muscular tissue, the "flap method by transfixion" is by far the best. Three forms will be described here: by antero-posterior flaps, by lateral flaps, and by a long anterior and short posterior flap (Van Buren's).

By *anterior and posterior* flaps. The limb being slightly rotated inward, and flexed somewhat, the tip of the long double-edged knife is entered a little above the greater trochanter, on a line with its posterior margin, and carried across the front of the joint, close to the bone, then slightly pushed backward, and brought out in the perineal fold, a little in front of the tuber ischii. Fig. 442. It is now carried downward, along the femur, and then turned gradually upward, so as to cut a flap from five

to eight inches long, according to the size of the limb.*

If the vessels are not perfectly controlled, the femoral artery will now bleed, and must be instantly grasped in the flap, secured and tied.

Fig. 442.



Amputation of the hip joint. 1, 2, 3, anterior flap; 4, knife in position before the flap is made.

The posterior flap is next made: the femur is drawn downward, so that the capsular and round ligaments may be readily divided, when the long knife is inserted behind the head of the bone, beginning about one inch below the line of the first transfixion, so as to make it cut its way out as before; here also forming a flap from five to eight inches in length.

By *lateral* flaps. The outer flap is the one first made. The surgeon determining the position of the head of the femur, passes in the long knife just over it; but by inclining the handle inward, he makes the blade just graze the outer side of the neck of the femur, grasping the tissues while an assistant abducts the limb, and bringing the point out a little below the tuber ischii. Clearing the greater trochanter, the knife is now made to cut a flap about eight inches long.

Next, by adducting the knee, the assistant holding the limb, puts the capsular ligament on the stretch, when the surgeon divides it, inserts the knife behind the head of the bone, and cuts the inner flap about six inches long beginning an inch below the line of commencement of the outer flap. As soon as possible the vessels are secured. The flaps are to be brought together and carefully adjusted by the interrupted suture, and dressed as before stated, with *Staphysagria* or *Hypericum* lotion.

Van Buren's method, is a very excellent one. The anterior

* Nothing but practice on the dead subject will give the knack of doing this. It is the same movement, but on a larger scale, as in the flap amputation of the arm.

flap having been formed by transfixion, as in the method firs described, is forcibly drawn upward by an assistant. "The surgeon then, slightly kneeling, carries the knife beneath the thigh to its inner side, as in a circular amputation, and placing its heel on the integuments at the internal angle of the wound, sweeps it firmly across through the tissues on the back part of the thigh, cutting with a slight sawing motion down to the bone, and joining the two extremities of the first incision. The long knife is then immediately relinquished, and with a large, straight scalpel, the femur being forcibly abducted, the capsule of the joint is laid open as near as possible to the acetabulum, the round ligament divided with the rotator muscles inserted into the trochanter, and the fossa at its base, the assistant managing the limb so as to keep these parts successively on the stretch, and the operation is completed."*

Amputation of the Thigh.†—Amputations of the thigh are commonly required, both for accident and for disease; they may be performed in three situations: immediately above the knee, in the middle of the limb, or in its upper third. In the amputation in the lower and middle third, a tourniquet may be applied high on the limb: but when the operation is done in the upper third there is no space for the application of this insrument, and the surgeon must then trust to an assistant compressing the artery as it passes over the brim of the pelvis. This is best done by grasping the great trochanter with the fingers of the right hand, and then applying the thumb firmly over the artery; upon this the other thumb is then pressed as firmly as possible, and thus all chance of letting the vessel slip is prevented.

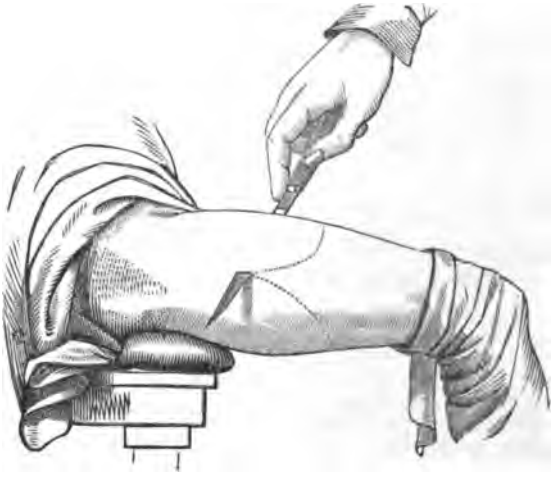
The *circular amputation* of the thigh is very simple, but the cicatrix falls over the end of the bone. It is thus performed: An assistant grasping the limb with both his hands, draws up the skin as far as possible, a movement which should be instituted in all circular amputations, while the surgeon holds the catlin lightly, and with his arm at first placed under the thigh, divides the skin and areolar tissue in one continuous sweep around the

* Trans. New York Academy of Medicine, vol. 1. Also, "Contributions to Practical Surgery," by W. H. Van Buren, M. D., Phila., 1865, p. 9.

† See Amputation of the Thigh, vol. 1, p. 714.

limb. The assistant now retracts the skin more decidedly than before, in which he is assisted by the operator's touching the subcutaneous tissues at various points with the knife. Close to the retracted integument the knife is again laid on, and by a second circular sweep around the limb, the superficial muscles are divided. These are pulled upward by a two-tailed retractor, when, by a third sweep of the knife applied close to the retractor, the bone is laid bare. Retraction is then applied to all the fleshy textures, touches of the knife assisting to expose the bone at a higher point, and this having been reached, complete isolation of the bone is effected there. The saw is then applied, while the retractor prevents the teeth of the saw from lacerating the muscular tissues. Bleeding having been arrested, the soft parts are loosened from the pressure of the retractor, and are so arranged by the interrupted suture and the subsequent dressings as to make the line of wound rectilinear.

Fig. 443.



Amputation of the thigh.

Fig. 443 represents the flap operation. The tourniquet being applied, an anterior flap is made by transfixion, and turned backward. Next, grasping the soft parts behind the bone with the left hand, the operator pushes the catlin through them, and cuts the posterior flap.

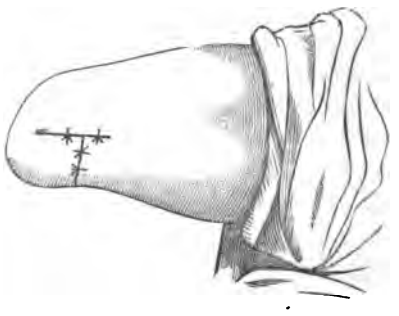
It is much better to make the anterior flap considerably longer than the posterior. This greatly favors the escape of the discharges, and brings the cicatrix at a more convenient point.

Perhaps a still better method is to make skin flaps, a long one anteriorly, a short one posteriorly; and then, turning both these up out of the way, to divide the muscles circularly.

The only objection to making the long anterior flap in either of these methods is that it makes the division of the bone come at a higher point than if the two flaps are made of the same length; and this is perhaps set aside by the advantages above mentioned.

Teale's *rectangular* method answers extremely well in the thigh. The same rule holds here as in other situations, viz., to make the anterior flap of a length equal to one-half the circumference of the limb, and of the same width; and the posterior one-quarter as long as the anterior. Thus, if the thigh is sixteen inches in circumference, the anterior flap will be eight inches long and eight wide, and the posterior, two inches long and eight wide. In tracing the lines for the flaps, as Teale advises to be done, the inner line should be drawn anterior to that of the vessels, which will thus be in the short or posterior flap.

Fig. 444.



Teale's amputation of the thigh, showing appearance of the stump and approximation of the flap.

Both flaps are dissected up close to the bone, which is then sawn through at the line of their junction. When closed, the stump will present the appearance shown in Fig. 444.

Amputation (Disarticulation) at the Knee Joint.*—This operation, in many cases a most valuable one, has gained strong advocates within the last few years.†

---

*See Amputation of the Knee Joint, vol. 1, p. 715.

†See an excellent paper by Dr. Brinton, of Philadelphia, in the American Journal of the Med. Sciences, for April, 1868. Drs. Markoe and Stephen Smith, of New York, have also advocated it.

Surgical Anatomy.—The knee joint is the largest in the body, and is conposed of the femur with its condyles, received into the two depressions at the upper end of the tibia; the patella lying in front. Besides the capsular ligament, these two bones are held together by the ligament of the patella, or tendon of the quadriceps, in front, by the hamstring muscles, inner and outer, and by the heads of the gastrocnemii, posteriorly, and by the two crucial ligaments within the joint. Close behind the articulation lies the artery, with the vein and nerve.

Operation.—This may be done, like that at the elbow, by the circular method; but the flap is preferable. A long and short flap are generally made; and there are two plans, according as the long flap is anterior or posterior. The latter will be first described, although, when circumstances will admit, the anterior is better.

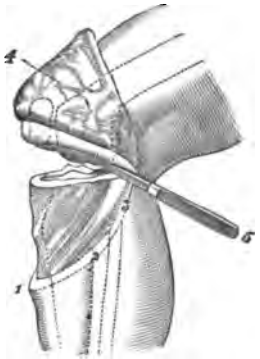
Long posterior flap. The knee being straight, an incision is made, beginning on one side of the joint, curving round just above the tubercle of the tibia, and ending opposite its point of commencement. Everything being divided down to the bone, the ligament of the patella is cut, and the soft parts reflected, opening the joint. The crucial ligaments are cut through, and the knee flexed to a right angle. Next, grasping the bones so as to push back the relaxed muscles of the calf, the surgeon carries the amputating knife back of the head of the tibia, and cuts downward so as to make a wide flap at least six inches long.

The disadvantage of this method is that secondary hemorrhage is apt to occur from the muscular arteries in the long flap.

Long anterior flap. The knee being flexed at a right angle, the surgeon describes with a scalpel an incision, beginning well behind the condyle of the femur, passing downward, and curving across the front of the leg an inch or more below the tubercle of the tibia. This flap being dissected up, the ligament of the patella is cut close to that bone, the joint opened, and the crucial ligaments divided. An amputating knife is now passed between the femur and tibia, and made to cut almost directly backward, thus forming a posterior flap of very small dimensions. (Fig. 445.)

The advantages of this method are: that secondary hemor-

Fig. 445.



Long anterior flap at the knee joint. 1, 2, 3, lower flap. 4, upper flap. 5, knife in position for making posterior flap.

rhage is not likely to occur; that there is a ready exit for discharges; that the cicatrix is so placed as to be out of the way of pressure when the stump comes to be used.

The *circular* method alluded to is already described but is not appropriate here and is at present wholly superseded by the flap.

Amputation of the Leg.*—This operation may be rendered necessary either by disease or by injury. It may be done at any point, as low down as circumstances will permit; in the old days of wooden legs the rule was to amputate high up, since a long stump, projecting backward, would be constantly in the way.

Various methods may be adopted, according to the amount of involvement of the soft parts. Sometimes the old circular operation, especially high up toward the knee, answers very well. The flap method, however, is now generally preferred, from the greater ease with which it is done, and the better position of the cicatrix.

Flap amputation of the leg may be done in one or two ways: by getting a long anterior and a short posterior flap, or the reverse,—a short anterior skin flap, and a long posterior muscular one. The advantage of the former is the more ready adjustment of the edges, and the greater facility of exit for the discharges; that of the latter, the ease of performance, and the bulk and solidity of the stump when healed.

Whichever is chosen, the spine of the tibia must always be sawed off obliquely after the division of the bone, so as to prevent the pressure which would otherwise come against the soft parts in front, from lacerating the anterior flap; in consequence of which I prefer the circular method, both in the leg and forearm.

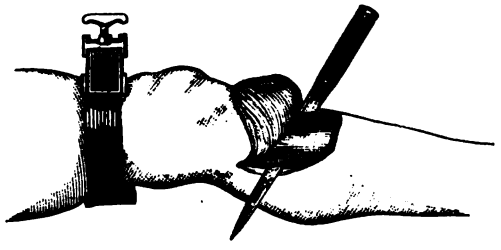
---

* See Amputation of the Leg, vol. 1, p. 717.

Operation.—Long *anterior* flap. The surgeon stands at the outer side of the right leg, at the inner side of the left, and carries an incision from a point far back on the opposite surface of the limb, downward, curving across, and then upward, so as to make a flap three-quarters as wide and long as the circumference of the limb at the point of commencement. Dividing all the tissues down to the bones, and dissecting them up, he next passes the knife behind both bones, and cuts the posterior flap about one-quarter as long as the anterior, making it full and round in shape. Next, passing a double-edged knife between the bones, he divides all the tissues at the line of junction of the flaps, and then retracting the latter, saws the bones across, dividing them at the same time. It remains only to saw off the spine of the tibia, to take up the vessels, and to bring the flaps together. Teale's amputation, the flaps being made rectangular, is much like this, and may be done according to the rules elsewhere laid down for it.

Long *posterior* flap. The surgeon, standing as before, makes his first incision through the soft parts in front of the limb, from the posterior edge of the bone on the farther side to the posterior edge of the nearer, curving it slightly with its convexity downward; he next enters a long double-edged knife behind both bones, at the base of this incision, and cuts the posterior flap from within outward, making it of ample length and fullness. Fig. 446. The remaining soft parts between the

Fig. 446.



Flap amputation of the leg with the tourniquet in position.

bones are next divided, the flaps retracted, the bones sawed through, the vessels secured, and the wound closed, as in the method already described. On account of the great weight of

the posterior flap, it must be very carefully supported until the healing is fully accomplished.

I have always given this latter method the preference wherever it could be performed at the upper portion of the leg, and the long anterior flap at the lower part, and I believe the experience of nearly all surgeons is to the same effect. The results, so far as my observation goes, lead me to the recommendation of these methods as given whenever the surgeon has the preference of selecting one or the other procedure.

Lateral flaps may sometimes be made in amputation of the leg, where a great saving of tissue can thus be accomplished; one long and one short lateral flap would answer the best, but the surgeon would have to be guided in any such case by the special circumstances existing. The main point would be to prevent the pressure of either bone against the upper or lower angle of the wound.

The vessels to be secured are the anterior and posterior tibials, the interosseal and peroneal.

Whatever plan is adopted, certain points must be carefully attended to. The bones must be sawn off as evenly as possible, the soft parts between them having been thoroughly divided. The saw must be made to cut through both bones at once, lest the fibula should splinter up. The spine of the tibia should be sawn off obliquely.

Amputation at the Ankle.*—The ankle joint consists of the tibia and fibula above, from which project downward the internal and external malleoli; into the tenon-like cavity thus formed is received the astragalus, the lower member of the articulation. Strong ligaments at the inner and outer side reinforce the capsular covering of the joint, which is further strengthened by the tendons which surround it. The main vessels and nerves run along the back of the joint, curving under the internal malleolus to get to the sole of the foot. A smaller vessel, the dorsalis pedis, runs in front.

Below the astragalus, and connected with it by two distinct articulations, is the calcaneum, or os calcis. This bone projects

* See Amputation at the Ankle Joint, vol. 1, p. 719.

backward so as to form the heel; in one form of amputation, to be presently described, this posterior portion is used in making the stump.

Operations.—*Chopart's Amputation* removes all of the tarsus except the astragalus and the calcaneum. As in the case of the last described operation, the plantar flap may be made first, or not until after disarticulation has been effected; the former plan is, in some respects, the best, as allowing the flap to be more regularly shaped. The incision should start on the outside of the foot from a point midway between the external malleolus and the tuberosity of the fifth metatarsal bone, and on the inside from a point half an inch behind the prominence of the scaphoid. Disarticulation may be much facilitated by forcibly bending the foot down so as to make tense the anterior ligaments of the joint. The scaphoid bone has often been left, unintentionally, in performing this operation, the resulting stump being nevertheless quite satisfactory. Care must be taken in the after-treatment, to prevent retraction of the heel, which is apt to occur, and which may require division of the tendo-Achillis.

Fig. 447.

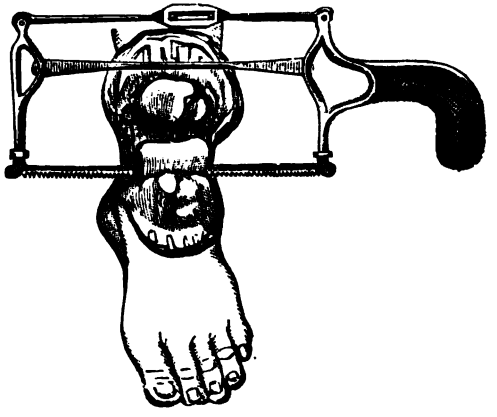
Chopart's operation; flap formed after disarticulation.

Sub-astragaloid Amputation.—In this operation all the bones of the foot are removed except the astragalus. Lisfranc did this amputation by cutting a dorsal flap, Lignerolles with two lateral flaps, and Malgaigne by taking a single flap from the inner part of the plantar surface. The best plan is, however, to make a flap from the heel, as in Syme's operation (to be presently described), which flap is then brought over the astragalus and attached to a short dorsal flap in front. Mr. Hancock has collected twenty-two cases of this operation, the results of which appear to have been usually satisfactory.

Pirogoff's Amputation.—In this operation the whole of the

foot is taken away except the posterior part of the os calcis, which is brought up and placed in contact with the sawn extremities of the tibia and fibula, from which the malleoli have been removed. The operation is thus done: A somewhat oblique incision, convex forward, is carried across the sole of the foot from one malleolus to the other, and the flap thus marked out dissected backward for about a quarter of an inch; a second incision, slightly convex forward, is then made across the front of the ankle, so as to open the joint; the astragalus is next disarticulated, when the surgeon, applying a narrow-bladed saw, or a "Butcher's saw," to the upper and posterior part of the calcaneum, behind the astragalus, divides it obliquely downward, in the line of the plantar incision. Fig. 448. The malleoli and

Fig. 448.



Pirogoff's amputation. Application of saw to os calcis.

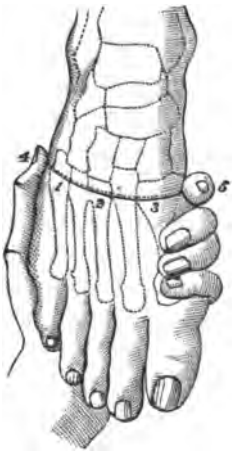
articulating surface of the tibia are then likewise sawn off, and the two cut surfaces of bone approximated. If Butcher's saw be used, the position of the blade may be reversed for the latter part of the operation, so as to saw off the malleoli from behind forwards. This amputation makes an admirable stump, the remaining portion of the calcaneum becoming firmly attached to the bones of the leg, and the natural length of the limb being retained. It is particularly adapted to cases of injury, though it may also be employed in those of disease, provided the calcis itself be not involved. Hancock has collected fifty-eight cases of Pirogoff's

amputation, done by British surgeons, death occurring in only five, while a useful stump is known to have resulted in forty-five. Five required re-amputation. Stephen Smith and Hewson have particularly investigated the merits of Pirogoff's amputation, and the latter believes it to be, in one point, superior to any operation done higher up, in that it enables the patient to *run* upon his stump as well as to walk. The same precautions as to retraction of the heel are necessary in the after-treatment of this, as in that of Chopart's operation; the purpose was well accomplished in Hewson's cases by applying a weight of four or five pounds to the back of the leg, by means of a broad strip of adhesive plaster.

Syme's Operation.—The following is Mr. Syme's own description of this operation: "The foot being held at a right angle to the leg, the point of a common straight bistoury should be introduced immediately below the fibula, at the center of its malleolar projection, and then carried across the integuments of the sole in a straight line to the same level on the opposite side. The operator having next placed the fingers of his left hand upon the heel, and inserted the point of his thumb into the incision, pushes in the knife with its blade parallel to the bone, and cuts close to the osseous surface, at the same time pressing the flap backward until the tuberosity is fairly turned, when, joining the two extremities of the first incision by a transverse one across the instep, he opens the joint, and carrying his knife downward on each side of the astragalus, divides the lateral ligaments, so as to complete the disarticulation. Lastly the knife is drawn around the extremities of the tibia and fibula, so as to expose them sufficiently for being grasped by the hand and removed by the saw. After the vessels have been tied, and before the edges of the wound are stitched together, an opening should be made through the posterior part of the flap, where it is thinnest, to afford a dependent drain for the matter, as there must always be too much blood retained in the cavity to permit of union by the first intention."

Amputation of all the metatarsal bones (*Lisfranc's operation*) is performed in the following manner: The exact situation of the articulation of the great toe to the inner cuneiform bone

Fig. 448.



Amputation showing position of hand in grasping the foot. 1, 2, 3, line of incision, 4 and 5 thumb and index finger on the points to denote position of incision.

(to which the tendon of the tibialis anticus may serve as a guide) being ascertained, a semilunar incision, with the convexity forward, is made down to the bone, across the instep, from a point just in front of the aforesaid articulation, to the outside of the tuberosity of the fifth metatarsal bone. The flap of skin thus formed being turned back, the bistoury is to be passed round behind the projection of the fifth metatarsal bone, so as to divide the external ligaments which connect it with the cuboid. The dorsal ligaments are next to be cut through, and then the remaining ones, the bones being depressed. The fourth and third metatarsal bones are to be disarticulated in a similar manner, dividing their ligaments with the point of the knife, and taking care not to let the instrument become locked between the bones. The first metatarsal is next to be attacked, and lastly, the second, the extremity of which being locked in between the three cuneiform, will be more difficult to dislodge. Perhaps it may be convenient to saw it across. When all the five bones are detached, the surgeon completes the division of their plantar ligaments, and slightly separates the textures which adhere to their under surface with the point of the knife, and then, the foot being placed horizontally, he puts the blade under the five bones, and carries it forward along their inferior surface, so as to form a flap from the sole of the foot sufficient to cover the denuded tarsal bones.

Amputation of the metatarsal bone of the Great-toe.—This operation is performed precisely like the operation for the removal of the metacarpal bone of the little finger. An incision is made down to the bone with a scalpel and is carried along its dorsum and round the root of the great toe, pressing the knife as close to the bone as possible and dissecting it out from the surrounding parts. The bone is then cut through with a pair of bone forceps, the vessels tied and the flaps brought together as heretofore directed.

Amputation of the toes at any of their joints is performed in precisely the same manner as amputation of the fingers. In removing a single toe from its metatarsal bone, the surgeon should be careful first of all to ascertain the exact situation of the joint which lies deeply imbedded in the soft structures. It is important, in order to preserve the elasticity of locomotion to save as much of the breadth of the foot as is possible.

Simultaneous, Synchronous, or Consecutive Amputation.—It occasionally becomes necessary, in cases of severe injury, to remove two or more limbs by primary amputation at the same time. Sometimes this has been done by two surgeons operating simultaneously, but it is better for one to do both amputations consecutively, beginning with the limb that is most severely hurt. Though the prognosis of these double amputations is always unfavorable, yet recoveries have followed with sufficient frequency to justify the surgeon in having recourse to the knife, when the condition of the patient will at all permit it. If the hemorrhage can be effectually controlled by tourniquets, it is better to remove both limbs before stopping to take up any vessels; though if the first amputation has produced much depression, it may be necessary to pause and administer restoratives before proceeding to the second. Perhaps the most remarkable case of synchronous amputation on record is that done by Dr. Koehler, of Schuylkill Haven, Pennsylvania, who thus removed both legs and one arm from a boy of thirteen, the lad making an excellent recovery in spite of this severe mutilation.

Dressing of the Stump.—After an amputation, the stump should not be dressed until all hemorrhage has ceased. Sometimes after all the recognizable vessels have been secured, a troublesome oozing continues from the face of the stump; this is usually venous bleeding, and will commonly cease of itself when the tourniquet is removed. If it do not, it may probably be checked by elevating the stump, and pouring over it a stream of cold water, or the application of *Gossypium* lotion. Bleeding from the medullary cavity of the sawn bone may be stopped by inserting a piece of dry lint, a plug of wood, or better, a pellet of previously softened white wax; the latter has the advantage of being perfectly unirritating, so that, if necessary, it may

be allowed to remain when the flaps are brought together. If the surgeon have any reason to fear consecutive hemorrhage, the stump should not be finally closed for some hours, or until complete reaction has occurred, a piece of lint, wet with *Gossypium* water, being meanwhile laid between the flaps, to prevent their adhering, and the sutures left loose until the surgeon is ready for the final dressing. The ligatures are to be brought out at one or both angles of the wound, as may be most convenient; it has been suggested to bring each one through the face of the flap by a separate puncture, but such a plan seems to me more adapted to delay union by producing increased irritation, than to promote quick healing. The edges of the amputation wound are to be brought together, *not too tightly*, by the use of sutures, and the flaps, if heavy, may be additionally supported by the use of adhesive strips. It is a great mistake to hermetically seal a stump; there is always a considerable flow of serum for some hours after an amputation, and if this fluid be not allowed to escape from the stump, it inevitably decomposes and produces irritation. Various modes of dressing a stump have been employed; Mr. Teale directed what has been called dry-dressing, which was, in fact, no dressing at all, the stump being simply laid on a pillow (which was covered with gutta-percha cloth), and protected by throwing over it a piece of thin gauze. Sir J. Y. Simpson highly commended the exposure of both amputation and other wounds to the air, calling the scab produced by this exposure a "natural wound lute." M. M. Guerin and Maisonneuve have, on the other hand, devised ways of treating stumps in exhausted receivers, giving their respective plans the euphonious titles of "pneumatic occlusion" and "continuous aspiration." The "antiseptic method" of Prof. Lister has been quite extensively used in the treatment of stumps, and is said to answer a very good purpose. The dressing which I prefer consists of a piece of sheet lint soaked in *Gossypium* or *Staphysagria* lotion. I have been in the habit of using one ounce of the tincture of *Gossypium* or *Staphysagria* to ten ounces of water; if the flap is large and vascular I prefer the *Gossypium*, if small and little hemorrhage is present I use the *Staphysagria*, secured in place with a light recurrent bandage; the local use of *Gossypium*

is not only soothing to the patient, but its styptic and antiseptic properties are often useful. In military practice cold water is the most convenient application to a recent stump, and, if not too long continued, answers very well. Whatever dressing is used, the stump should not be disturbed for forty-eight or seventy-two hours, by which time suppuration will usually have begun; the wound may then be dressed with *Calendula* lotion, or with any other substance that the condition of the part may indicate.

If organic sutures have been used, they should be removed about the third or fourth day; metallic sutures may remain longer, and need not usually be taken away until firm union has occurred, and until they are therefore of no further use. The ligatures may be expected to drop from the smaller vessels after the fifth or sixth day; from the larger arteries after the tenth or twelfth. The ligatures around the larger vessels should always be allowed to *drop* of themselves; but when the time usually requisite for their separation has elapsed, the surgeon may at each dressing gently *feel* them, to ascertain if they are loose. If acupressure has been employed, the pins or needles from the smaller vessels may be removed on the second day; that on the main artery on the third or fourth, according to the extent of the clot formed, which may be estimated by the point at which pulsation in the flap ceases.

Structure of a Stump.—A stump continues to undergo changes in its structure for a long while after cicatrization is completed; the muscular substance wastes, and the muscles and tendons become converted into a dense fibro-cellular mass, which surrounds the bone; the bone itself is rounded off, and its medullary cavity filled up; the vessels are obliterated up to the points at which the first branches are given off, firm fibrous cords marking their place below; the nerves become thickened and bulbous at their extremities, these bulbs being composed of fibro-cellular tissue, with numerous nerve fibrils interspersed. Upon the firmness and painlessness of a stump, depend greatly the facility and comfort with which an artificial limb can be worn. In the case of the upper extremity, there is comparatively little difficulty, and very ingenious and serviceable arms and hands are now supplied by the manufacturers. In the lower extremity, it is found that very

few stumps will bear the entire pressure produced by the weight of the body, in walking upon an artificial limb, and hence a portion at least of the pressure should be taken off, by giving the apparatus additional bearings upon the neighboring bony prominences; thus for an amputation of the leg, the artificial limb should bear upon the knee, while in the case of a thigh stump, the tuber ischii and hip should receive the principal pressure.

Affections of Stumps.—Any one of the constituents of a stump may give trouble after an amputation, and the treatment of the morbid conditions of a stump is a very important matter for the surgeon's consideration.

Spasm of the muscles often occurs and causes much suffering a few hours after an amputation; it is best treated by the use of a moderately firm bandage around the part and the internal use of *Aconite*, *Nux Vomica*, *Ignatia*, *Lachesis* or *Causticum*.

Undue retraction of the muscles may occur and continue for days or even weeks after an amputation, interfering with cicatrization, and giving rise to a very intractable form of ulceration or even going so far as to produce what is called a *conical* or *sugar-loaf* stump. The *mechanical ulcer*, as it is called, of stumps, requires the limb to be firmly bandaged with circular and reversed turns from above downward; the action of the muscles is thus restrained, and the soft parts coaxed downward, as it were, and enabled to heal while the tension is removed. There is, however, another cause for the production of conical stumps in cases of young persons, apart from muscular retraction or wasting by suppuration; this is a positive elongation of the bone by growth subsequent to amputation. This is chiefly seen in the leg and upper arm, and its occurrence in these situations, rather than in the thigh or forearm, is easily accounted for by remembering the physiological fact, that the upper extremity grows principally from the lower epiphysis of the humerus and the lower epiphysis of the radius and ulna, while the lower extremity grows chiefly from the lower epiphysis of the femur and the upper of the tibia. Hence, in amputations of the thigh or forearm, the principal source of growth for that particular member is taken away; while in the upper arm or leg, it remains, and is liable to cause subsequent protrusion of the bone through the soft parts.

To whatever cause the existence of a conical stump be traceable, if the stump will not heal over the bone, or if, though a cicatrix form, it be thin, tender, and constantly liable to reulcerate, there is but one remedy, which is to resect the projecting end of the bone; this is fortunately a proceeding which is attended with but little risk, and its results are usually satisfactory.

Erysipelas or *diffuse cellular inflammation* may attack the tissues of a stump; and either constitutes, under these circumstances, a very serious affection. All sutures should be at once removed, appropriate local dressings applied, and the general treatment adopted for that disorder.*

Secondary hemorrhage may occur from the vessels of a stump, at any time before complete cicatrization has taken place. If it be not profuse, elevating the part, and the application of cold, or pressure, will often be sufficient to check the bleeding; if it continue, or recur, more decided measures must be adopted, which is discussed in the chapter on Hemorrhage from Wounds, vol. 1, p. 625.

Aneurismal enlargement of the arteries of a stump occasionally occurs, and must be treated on the same general principles as given elsewhere for aneurismal varix.

Neuroma, or painful enlargement of the nerves of a stump, occasionally occurs. When it is possible to detect any distinct tumor connected with a nerve, it would be proper to cut down and remove it; under other circumstances a reamputation may be performed, though unfortunately this is by no means an infallible remedy; Dr. Nott gives a case in which a man submitted to three reamputations and three nerve excisions for neuralgia of a stump, deriving at last only questionable benefit from this large experience in operative surgery. As a palliative remedy, the application to the stump of the strong tincture of the root of aconite is occasionally useful, or hypodermic injections of *Morphia* may be used, with the internal use of such remedies as may be indicated under the head of Neuralgia.

The tendons in the neighborhood of a stump may become contracted and cause troublesome deformity; thus, after Chopart's amputation of the foot, the natural arch of that organ being

* See Erysipelas, vol. 1, p. 357.

destroyed, the tendo-Achillis may be drawn up by the powerful muscles of the calf, and a painful form of club-foot result, the cicatrix being thrown against the ground in walking. The occurrence of this condition should, if possible, be prevented by the use of appropriate splints and bandages, and it may be sometimes even necessary to resort to tenotomy when milder measures will not suffice.

Periostitis, *Osteitis*, and *Osteo-myelitis*, one or all, may occur in a stump, and may defeat the surgeon's anticipations of a successful issue. If acute and extensive, these affections endanger life, and, especially in the femur, are apt to terminate fatally. The diffuse suppurative form of osteo-myelitis is especially apt to occur when the division of the bone has exposed the medullary cavity, and is almost sure to end in pyæmia and death; the only mode of treatment is reamputation at the nearest joint, and this is of course an almost desperate remedy. Less violent forms of bone inflammation result in the occurrence of *Necrosis*, which may likewise be produced by injury from the saw, at the time of operation. The treatment of this condition consists pretty much in waiting for the natural separation of the necrosed part, which will then be *exfoliated* as a ring of dead bone, or as a long conical sequestrum. I do not believe that anything is to be gained, under these circumstances, by interference with the slow but safe processes of nature; in the case, however, of the occurrence of acute necrosis, as it is sometimes called, or more properly *diffuse subperiosteal suppuration*, it may be necessary to reamputate to save life, just as it would be under the same circumstances occurring elsewhere than in a stump.*

Finally, an adventitious *bursa* may be formed over the bone of a stump, as in any other part subjected to much pressure. If this bursa become painful, the artificial limb should be altered so as to relieve it from pressure; if this be not sufficient, an effort may be made to obliterate the bursa by the introduction of the tincture of iodine or by establishing a small seton, or the bursa itself may be excised.

Mortality after Amputation.—The results of amputation depend on a variety of conditions. Some of these are common

* See chapter on Necrosis, vol. 1, p. 796.

to this as to other serious operations, and have mostly been sufficiently referred to in the chapter on operations in general; the most important circumstances coming into this category are the age and the constitutional state of the patient, and the hygienic conditions to which he is subjected before, at the time of, and after the amputation. The relation between the *barometric condition* of the atmosphere and the mortality after amputation has been particularly investigated by Dr. Addinell Hewson. He finds that, at the Pennsylvania Hospital, the mortality varied from 11 per cent. with an ascending, to 20 per cent. with a stationary, and 28 per cent. with a falling barometer. While the column of mercury was rising, the average duration of life, in fatal cases, was only seven days, but was thirteen while the column was falling; and of all the cases that died within three days, over 75 per cent. proved fatal while the barometer was rising. "Surely," he adds, "these figures need no commentary as to how well they sustain the idea that the results of operations are materially influenced by the weather, and that the risks from shock are increased by opposite conditions."

The most recent statistics as to the influence of the *age* of patients upon the results of amputation have been collected by Mr. Holmes, of St. George's Hospital, who finds that "the risk of amputation is constantly rising throughout life, and at any given period after thirty years of age the risk is more than twice as great as it was at the same period after birth."

Besides the circumstances which have been referred to, there are others which affect the result of amputation, and which are peculiar to this as distinguished from other operations; these are now to be considered.

1. *Locality.*—The part of the body at which an amputation is performed exercises an important influence on the result; amputations of the lower extremity are more apt to prove fatal than those of the upper, and in the same limb the rate of mortality varies directly with the proximity to the trunk of the point of amputation.

These facts will appear from the following table, which has been prepared from the published statistics of French, British, and American hospitals, and from those of our late war, together with those of the war in the Crimea.

Table showing Mortality of Amputations in Different Parts of the Body, for Traumatic Causes, in Civil and in Military Practice.

	Civil Hospitals.			American and Crimean Wars.			Aggregates.		
Locality.	Cases.	Deaths.	Mortality, per cent.	Cases.	Deaths.	Mortality, per cent.	Cases.	Deaths.	Mortality, per cent.
Thigh...	269	143	53.16	3516	2715	77.22	3785	2858	75.51
Leg.....	476	216	45.38	3278	1089	33.22	3754	1305	34.76
Arm....	256	67	26.17	3091	973	31.48	3347	1040	31.07
Forearm	197	25	12.69	1046	301	28.78	1243	326	26.23
Totals..	1,198	451	37.65	10,931	5078	46.46	12,129	5,529	45.58

In amputations of the thigh, the mortality varies according as the operation is done in the upper, lower, or middle third. The following are the percentages given respectively by Legouest and Macleod, both referring to the British army in the Crimea, though for different periods of the war :

	Legouest.	Macleod.
Upper third.....	87.2	86.8
Middle third.....	58.5	55.3
Lower third.....	55.0	50.0

2. The *part of the bone* which is divided in an amputation influences the result, the mortality being greater when the medullary cavity is opened than when only the cancellous structure at the end of the bone is involved. This appears to be owing to the greater probability of pyæmia supervening under the former circumstances. Of 295 cases of amputation which were followed by pyæmia during our late war, 155, or 52.5 per cent., were through the shaft of the femur (*Circular No.* 6, S. G. O. 1865, p. 43.

3. The *nature of the affection* for which an amputation is done, exercises a most important influence upon the result; thus amputations for injury are much more fatal than those for disease; the removal of a limb for cancer is more likely to be followed by death than the same operation if practiced for caries or a chronic joint affection; while amputations of *complaisance* or *expediency* (as for deformity) are less successful than those for

other pathological conditions. The relative mortality for amputations for injury and disease, as exhibited by the published reports of hospital practice in various countries, is shown in the following table:

Amputations for Injury.				For disease or deformity.			Totals.		
Place of observation.	Cases.	Deaths.	Mortality, per cent.	Cases.	Deaths.	Mortality, per cent.	Cases.	Deaths.	Mortality, per cent.
French hospitals.....	652	378	57.98	947	406	42.87	1599	784	49.03
English hospitals.....	537	209	38.92	955	197	20.63	1492	406	27.21
American hospitals....	751	215	28.63	278	51	18.35	1029	266	25.85
Aggregates.....	1940	802	41.34	2180	654	30.00	4120	1456	35.34

The mortality which attends amputations of expediency has been particularly investigated by Mr. Bryant, of Guy's Hospital, who finds it to be (in that institution) 30.3 per cent., as compared with a death-rate of 12.57 per cent. for other pathological causes; or, if the lower extremity alone be considered, the former class of cases gives a mortality of 40 per cent., and the latter of 15 per cent. (*Med.-Chir. Trans.*, vol. 42, p. 86).

4. In amputations of the same category, the *time* at which the operation is done exercises an important influence over the result; thus, amputations for *acute* affections of the bones or joints are much more fatal than those for chronic diseases of the same parts. Amputations for traumatic causes are usually divided by surgical writers into *primary* or *immediate*, and *secondary* or *consecutive*. Primary amputations are such as are done before the development of inflammation, a period rarely exceeding twenty-four hours, though, if there have been much shock, it may reach to forty-eight hours, or possibly still longer, from the time at which the injury was received. Military writers make a third class, the *intermediate*, which embraces all operations done during the existence of active inflammation, reserving the term secondary for such as are done after the subsidence of inflammatory symptoms, and when the condition of the part somewhat assimilates the case to one of amputation for chronic disease.

It is now universally acknowledged among military surgeons that primary amputations (except of the hip joint and the upper part of the thigh) do better than others; of those which are not primary, the secondary do better than the intermediate. It is, however, commonly said that in *civil* practice secondary amputations are more successful than primary, and this difference has been accounted for by the different hygienic circumstances by which soldiers and civilians are respectively surrounded. The usual statement upon this point is erroneous, and a careful collation of statistics will show that in both civil and military practice, primary amputations are followed by better results than others. To illustrate this point, a table has been drawn up which shows the results of primary amputations, or those performed in the pre-inflammatory stage, as compared with those of all others for traumatic causes.*

Primary.			Secondary and Intermediate.			Observations from Civil Hospitals.	
Cases.	Deaths.	Mortality, per cent.	Cases.	Deaths.	Mortality, per cent.	Reporter.	Reference.
49	34	69.4	20	13	65.0	Malgaigne.	Arc. de Med., 1842.
64	15	23.4	28	10	35.7	James.	Trans. Prov. Med. and Surg. Ass., [vol. 17.
18	7	38.9	5	2	40.0	South.	Notes to Chelius, vol. 3.
74	39	52.7	43	26	60.5	Laurie.	James, loc. cit.
169	62	36.7	53	37	69.8	Steele.	Ibid.
180	60	33.3	87	61	70.1	McGhie.	Macleod, Surg. of Crimean War, p.
50	9	18.0	6	1	16.7	Hussey.	Ibid. [367.
48	18	37.5	43	19	44.2	Erichsen.	Science and Art of Surgery, p. 62.
40	8	20.0	9	6	66.7	Parker.	Cooper's Surg Dict., vol. 1, p. 121.
71	23	32.4	10	3	30.0	Fenwick.	Ibid.
93	15	16.1	37	13	35.1	Callender.	Med.-Chir. Trans., vol. 47.
76	33	43.4	24	12	50.0	Bryant.	Ibid., vol. 42.
108	49	45.4	43	22	51.2	Steele.	Guy's Hosp. Rep., 3d s., vol. 15.
37	12	32.4	24	7	29.1	Buel.	Am. Journ. Med. Sci., 1848.
29	14	48.3	13	7	53.8	Lente.	Trans. Am. Med. Assoc., vol. 4.
30	11	36.7	23	9	39.1	Hayward.	Am. Journ. Med. Sci., 1840, 1851.
258	53	20.5	88	31	35.2	Norris.	Ibid., 1838, 1840, and 1854.
231	59	25.5	20	10	50.0	Morton.	Am. Journ. Med. Sci., 1870.
1625	521	32.1	576	289	50.1	Aggregate.	

It will be perceived from this table, that, except in the reports of Malgaigne, Hussey, Fenwick, and Buel, the primary amputa-

* In this, as in the preceding tables, double amputations are not included; this will account for some apparent discrepancies between the figures in the text and those given by the authors quoted.

tions have been invariably less fatal than the others; while in the aggregate the mortality of the primary has been nearly 1 in 3, compared with a death rate of 1 in 2 for the intermediate and secondary operations. There are no extended statistics to show the relative mortality of the two latter classes of amputations; but as far as they have been distinguished by writers on the subject, the general impression has been confirmed that intermediate operations are very fatal, and that those done when the inflammatory symptoms have subsided are comparatively successful.

These numerical considerations, however, though interesting, scarcely give a fair view of the whole merits of the case; for primary operations are naturally done in cases where there is no possibility of saving the limb, while consecutive amputations are, on the other hand, performed in cases which are to a certain extent selected. Moreover, the least hopeful cases among any large number are eliminated by death before the secondary period is reached, so that even if the numerical chances of consecutive operations were the best, it would by no means be proved that more lives would not have been saved had more limbs been primarily amputated.

The practical rule to be derived from what has been said, is that in any case of injury in which it is evident that an amputation will be needed, the operation should be done as soon as possible after reaction has occurred, and before the injured part has become inflamed; but if by any chance this golden opportunity has been lost, and the intermediate or inflammatory stage has come on, operative interference must if possible be postponed until the inflammation has measurably subsided, and till the patient's condition has become assimilated to that of a case of chronic disease rather than of traumatic lesion.

To complete this part of the subject, I quote from Dr. Macleod (*Notes on the Surgery of the Crimean War*, p. 867) the following summary of the results of primary and secondary amputations in military practice:

Primary operations,	1047	cases,	374	deaths;	mortality	35.7 per cent.
Secondary do	594	do	314	do	do	52.8 do

A percentage which it will be observed, corresponds very closely with that derived from observations in civil hospitals.

The complete statistics of amputations in the late war of the rebellion have not been published; the following extract from Circular No. 6, S. G. O., 1865, will serve, however, still further to confirm what has gone before. Of 1597 amputations of the thigh, "the date of operation is ascertained with precision in 1061. Of these, 423 were primary, and 638 were intermediate or secondary. The ratio of mortality was 54.13 in the former, and 74.76 in the latter."

Causes of Death after Amputation.—The causes of death after amputation have been made the subject of special study by several writers, among whom may be particularly mentioned Malgaigne, James, Bryant, Holmes, and Birkett. The three last named gentlemen are the most recent authorities on the matter, and I will terminate this chapter by quoting some of the *conclusions* appended to their excellent papers. Mr. Holmes finds from examining the records of 300 cases—

"That a considerable proportion of cases must occur in hospital practice, in which death is really inevitable, although it is not known to be so at the time of amputation.

That of the fatal cases which remain, in about one half death is due mainly to previous disease or injury.

That secondary hemorrhage is hardly ever a cause of death, except in persons with diseased arteries.

That death from exhaustion hardly ever occurs without previous disease, obviously proved both by symptoms and post-mortem appearances.

That the other hospital affections (erysipelas, diffuse inflammation, and phagedæna or hospital gangrene) are rare in subjects previously healthy, and that, as a rule, they only prove fatal when they are the precursors of pyæmia.

That therefore any attempt to estimate the dangers of amputation in hospital practice, or to diminish its mortality, must be based upon a knowledge of the conditions under which pyæmia occurs in cases treated separately, and in patients congregated in hospital wards."

Mr. Bryant's tables likewise include 300 cases, and from his "General Conclusions" I select the following:

That *Pyæmia* is the cause of death in 42 per cent. of the fatal cases, and in 10 per cent. of the whole number amputated.

That exhaustion is the cause of death in 38 per cent, of the fatal cases, and in 8 per cent. of the whole number amputated.

That the following causes of death are fatal in the annexed proportions:

	Of fatal cases.		Of whole number.	
Secondary hemorrhage	7.0 per cent.,	or	1.66 per cent.	
Thoracic complications	5.6 "	"	1.33	"
Cerebral do	3.0 "	"	.66	"
Abdominal do	1.4 "	"	.33	"
Renal do	3.0 "	"	.66	"
Hectic do	3.0 "	"	.66	"
Traumatic do	7.0 "	"	1.66	"

Pyæmia is the chief cause of death after pathological amputations, after those of expediency, and after primary amputations for injury.

Exhaustion is the chief cause of death after secondary amputations for injury, and ranks next to pyæmia as a cause of death after the primary, and those classed as pathological (see *Med. Chir. Trans.*, vol. 42. pp. 85–90).

Mr. Birkett, from a study of 171 cases, in which the operation was performed either by himself or under his direction, concludes that "a large proportion of the patients submitted to amputation, when inmates of a metropolitan hospital, are the subjects of more or less advanced chronic disease of the thoracic or abdominal viscera," and that "the chances of death after operations appear to depend almost entirely upon the previous state of each patient's constitution."

CHAPTER XII.

MINOR OPERATIONS.

SECTION I.

OPERATIONS FOR NÆVUS.

Nævus is an affection very analogous to aneurism by anastomosis, but differs from it in involving chiefly the capillaries or veins. When congenital, nævus constitutes the so-called *mother's mark.*

Capillary Nævi, which are commonly, if not always, congenital, occur as flattened elevations, of a red or purple hue, usually upon the face or upper part of the trunk, but occasionally in other situations. They may involve a considerable extent of surface, but rarely give any annoyance except from the attendant deformity. Sometimes, however, they ulcerate and bleed. They consist of a congeries of capillary vessels, and may accompany the aneurism by anastomosis on the one hand, or the venous nævus on the other.

Venous Nævi occur as prominent tumors or outgrowths, of a reddish purple hue, smooth or lobated in outline, and somewhat compressible, doughy, and inelastic to the touch; they are less exclusively confined to the upper part of the body, and, in their structure, consist of thin tortuous and sacculated veins, often interspersed with cysts. Venous nævi may occur *subcutaneously*, when they form tumors which may be partially emptied by pressure, slowly filling again when the pressure is removed, and becoming distended by violent exertion or struggling on the part of the patient.

Operations.—*Cutaneous nævi* which are small and not disposed to spread, may often be left without operative treatment—when they may disappear spontaneously; and, on the other hand, a nævus may involve such a large extent of surface as to forbid any attempt at its removal. The shriveling of small cutaneous

nævi, may sometimes be hastened by the application of tincture of *Iodine*. Moderately large, or subcutaneous, or even small cutaneous nævi, if they are so placed as to cause disfiguration, may be removed by several methods. Various plans have occasionally proved successful, such as *vaccination* over the growth, the use of a *seton*, the introduction of *heated wires*, *electro-puncture*, or *subcutaneous discission* with *compression:* the best modes of treatment, however, are commonly the application of *caustics*, the use of *coagulating injections*, *excision*, and *ligation*.

When the nævus is superficial, and so situated that the presence of a scar will not be particularly objectionable, the application of *nitric acid* or the *Vienna paste* may suffice to effect a cure, the application being repeated if there be any tendency to a recurrence of the affection.

Anæsthesia is not necessary in children under two or three years of age, on whom these operations are generally done.

1. *Vaccination*. This may be done either by the ordinary plan, scoring the skin over the nævus and applying the lymph or the scale softened in water, or by saturating a silk thread with the softened scale, and passing it through the growth. The latter plan has been found perfectly successful in small and superficial nævi.

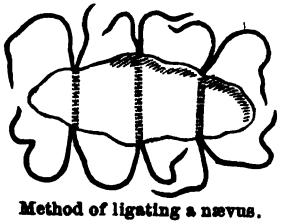
2. *Injection*. With a small hypodermic syringe, a few drops of a strong solution of perchloride of iron, or nitrate of silver, may be injected into the substance of the nævus, which becomes inflamed, and either shrinks away, or suppurates. Of course this may be repeated at different points, if the growth is of large size, and if the first operation fails to act upon the whole of it. (Fatal results have been met with from the injection of nævi on the face or neck; and it would be safer, even in the extremities, to occlude the veins at the cardiac side of the growth by pressure, for a short time—a quarter of an hour at least—after the throwing in of the fluid.)

3. *Cauterization*. This may be done either with the actual cautery, or with nitrate of silver. An ordinary cauterizing iron may be lightly applied at a white heat; or if the nævus be very small, several heated needles may be thrust through it. Or, a

broad needle or very narrow bistoury may be passed into the little tumor, withdrawn, and a probe coated with nitrate of silver inserted in the orifice. This, also, can be done at several points if desired. Should troublesome hemorrhage ensue, the surgeon may at once resort to the ligature, to be presently described.

4. *Ligation.* Sometimes the vascular mass is pediculated, when a silk thread may be tightly tied around is base. When it involves the skin, two needles may be thrust under it, at right angles to one another, and a thread tied around them so as to strangulate the vessels. If the nævus be of irregular shape, it will sometimes be necessary to pass several needles, and to tie the silk thread around them all. In the case of an irregular or elongated nævus, a ligature may be applied as in Fig. 450. A needle is armed with a very strong thread, and carried across the base of the growth near its end; the thread is then cut at the eye of the needle, and one of its ends taken up and carried across again, to be again cut at the eye of the needle. This may be repeated as often as necessary, until the whole mass can be strangulated by knotting together two of each three pair of ends, and strongly drawing the third pair, which may then be tied.

Fig. 450.



Method of ligating a nævus.

For nævus of the tongue, the use of the *ecraseur* may be advantageously substituted for that of the ligature. H. Lee has recently recommended, in cases of vascular tumor of the face and neck, the use of *India-rubber thread*, instead of the common ligature, the elastic contraction of this agent serving to divide the tissues without hemorrhage, and thus effecting rapid and painless removal of the morbid growth.

5. *Exsection.* Usually there is no vessel of any size going to a nævus; and hence, by making slight pressure, incisions may be made around it, the whole mass removed, and the bleeding readily checked.

Another plan is to pass two or more needles across under the growth, entering them and bringing them out about one-eighth of an inch from its margins; than to excise it, and close the

wound at once by applying a thread over the needles as in the ordinary harelip suture.

Whichever of these plans is used, except the first, a very simple protective dressing, such as lint dipped in *Hypericum* water, or a piece of soft rag spread with *Hypericum* cerate, should be put on, and secured with a few adhesive strips. When the part will be covered by the clothing, the latter form of dressing is best, for obvious reasons.

SECTION II.

OPERATIONS FOR VARICOSE VEINS.

Dilatations of the superficial veins of the lower extremity are sometimes so troublesome, from painful pressure on nerves, from preventing the healing of ulcers, or from the risk of their bursting, as to justify an operation for their obliteration.

Operation.—Anæsthesia is hardly necessary. A harelip pin is passed through the skin, dipped clear under the vein, and brought out on the other side; the points of entrance and exit being about a quarter of an inch from the enlarged vessel. (Care must be taken not wound the vessel.) This being done at several points half an inch to an inch apart (the upper pin being first inserted), bits of bougie are laid over each pin, parallel with the vein, and silk threads tied in a figure-of-8 over the ends of the pin, between which and the bougie the vein is compressed and occluded. In five or six days the threads may be cut, and the pins drawn out. A bandage or an elastic stocking should be worn for some time afterward. It is obvious that this plan is very analogous in principle to that of acupressure, described in vol. 1, page 163.

Hypodermic Injection.—The hypodermic method of treatment is now very much used, and it is probable that its full capabilities have not even yet been developed. The physician employs a considerable variety of drugs by this method, but the only remedy which has been as yet much used in surgery by hypodermic injection is *Morphia*, though some experiments have lately been made with *Mercury* thus administered in cases of

syphilis. The most convenient preparation of *Morphia* for hypodermic use is the strong solution of the sulphate, known as Magendie's solution. Its strength is sixteen grains of the salt to the fluid ounce, and eight minims therefore contain about a quarter of a grain of *Morphia*, which is a large enough dose to begin with. The cylinder of the hypodermic syringe should be of glass and graduated to minims, and the piston should fit accurately. In giving hypodermic injections, the surgeon should pinch up a fold of skin with the left hand, and thrust in the nozzle of the syringe with a quick motion and in a somewhat oblique direction; great care must be taken to avoid any subcutaneous vein, as from neglect of this precaution serious symptoms of narcotic poisoning may be rapidly induced, the drug being instantly thrown into the circulation, instead of being gradually introduced by absorption from the subcutaneous areolar tissue. The nozzle of the syringe should be kept sharp and *scrupulously clean;* if it be not clean, its use is apt to be followed by considerable irritation, and sometimes the formation of a small abscess; a result which very rarely follows the hypodermic injection of Magendie's solution, with a clean syringe. I have used this method of relieving severe pain successfully when other remedies failed of relief, and after composure of the system for a few hours a return to the same remedies effected a cure of the disease.

SECTION III.

VACCINATION.

Vaccination is usually performed by the physician or accoucheur, rather than by the surgeon; still it may be regarded as a surgical operation, and a brief reference to it will, therefore, not be out of place. Vaccination may be effected either with the lymph of the vaccine vesicle, with the dried scale, or with the pure vaccine virus; the scale is probably more often employed in this country, and is usually quite satisfactory. The scale should be of a dark amber color, and not too thin; a sufficient portion is to be shaved off with a lancet, and rubbed up with a few drops of water till it forms a mixture of creamy consistence. The

skin is then to be slightly abraded with a dull lancet, until the slightest pink tinge is perceived, when the vaccine matter is to be applied, and slowly worked in. In using the pure vaccine virus from the calf, I prefer the plan just described, substituting the *lymph*, of course, for the vaccine matter, which I believe to be the only true method of protection from this dreaded disease.

Some surgeons prefer to introduce the vaccine matter by two or three *punctures*, and others by minute *incisions*. The plan which I have described seems to me the best, as less likely to draw blood, which might wash away the matter, and thus defeat the operator's object. The place usually selected for vaccination is the left arm, about the point of insertion of the deltoid muscle. Some persons appear to be insusceptible to the vaccine influence, while in others the protective power of the operation appears to wear out in the course of years; hence it is well to revaccinate from time to time, especially if the patient be in any way exposed to the epidemic influence of small-pox. The surgeon should, of course, be careful, if he employs the scale, to select a good crust from a healthy child; he should also look closely to cleanliness of his lancet. Vaccination, like any other operation, may be followed by inflammation, or even by erysipelas, and there seems to be no doubt that on several occasions syphilis has been inoculated by careless vaccination; hence too much caution cannot be exercised as to the source of the vaccine scale, and as to the cleanliness of the instrument employed. The best age for vaccinating infants is about the end of the third month, though it may, if necessary, be done at a much earlier period.

SECTION IV.

OPENING OF ABSCESSES AND SINUSES.

A few words may here be said on these very common operations, which are not always done in the right way. Anæsthesia being hardly ever deemed necessary, the patient is saved much pain by the use of instruments which are in perfect order, and by executing the manœuvre as instantaneously as possible.

Abscesses.—When an ordinary superficial abscess is to be opened, the surgeon should steady the part with his left hand,

while with his right he plunges a sharp-pointed curved bistoury through the wall of the abscess, depresses the handle so as to carry the point on as far as he deems proper, thrusts it up and out through the skin by further depressing the handle, and completes the cut by raising the instrument. All this is done almost at the same moment, the hand being steady but free, so that no harm can occur if the patient should start.

For the opening of a bubo, it is sometimes better to give an anæsthetic, since there are often several blind pouches to be followed up, and the patient's courage may fail after the first cut is made.

To open a deep abscess, a point is selected where no important vessels or nerves will be wounded; a straight sharp-pointed bistoury is thrust in perpendicularly to the skin, and rotated a little on its long axis, when, if the cavity is reached, the pus will well up alongside of it; the muscular and other deep-seated tissues may now be divided by cautiously moving the blade to and fro. If there is any difficulty in reaching the abscess, from the risk of doing injury with the knife, a pair of dressing forceps may be inserted in place of it, and the blades expanded steadily but gently, so as to prepare a way for the escape of the pus.

When, as in the case of psoas abscess, or of suppuration in the cavity of a joint, it is desirable to make a valvular opening, a fold of skin may be pinched up, and a straight sharp-pointed bistoury thrust nearly through its base; then by raising the handle of the instrument its point may be brought into position to be pushed on into the cavity of the abscess, and upon withdrawing it, a track or sinus will be left for the discharge of the matter.

A practice which is often followed, but which is both useless and painful, is to squeeze out the cavity of an abscess. Time is not gained by this, but lost. It is far better to use the very gentlest compression continuously, than to thoroughly force out a quantity of pus once a day, only to be reformed by the bruised and irritated walls. In large, cold abscesses, indeed the gravest consequences may ensue upon their being either abruptly emptied or roughly handled.

If a seton is to be used, or a drainage-tube (a slender tube of India-rubber, its walls perforated with numerous holes), we may

either pass a long and strongly-curved needle into the abscess and out of it at the desired points, drawing it through with its thread, to which may be attached the seton or tube; or we may make two openings with a bistoury, and then carry through them both an eye probe, as a substitute for the needle.

Sinuses.—The only direction which need be given for the laying open of sinuses is that it should be freely done, with a very sharp-edged bistoury. If the point of the knife is sharp, a grooved director is usually needed as a guide for it; if it has a probe-point, it may be made to find its own way.

SECTION V.

TRANSFUSION OF BLOOD.

This very important procedure, the injection of fresh blood into the body, has been several times done by Dr. J. G. Allen, of New York, within the past year or two, in cases of extreme exhaustion from hemorrhage. In one case it is stated that it was a perfect success; in two others the benefit derived was only temporary, death ensuing from other causes.

Operation.—Anæsthesia is obviously out of the question in almost all the cases requiring this procedure.

The instruments necessary are: a glass syringe of about four fluid drachms capacity, in perfect order, with a needle-pointed tube like that of the small hypodermic syringe, but larger, and a cup for holding the blood to be injected. The cup is double, the outer portion being filled with water at a temperature of 105 deg., Fahr., by means of the opening at the edge; the inner portion is of conical shape in order to the easy reception of the blood, and filling of the syringe with it without waste. The blood being drawn from a healthy person, is whipped with a little bunch of twigs (a piece of a whisk or broom answers very well) so as to separate the fibrin, and quickly strained through a piece of fine clean old linen, into the cup. The syringe, thoroughly warmed, is next filled from the cup, and fitted to the tube, which is then thrust into one of the veins of the forearm of the sick person, the vein being made prominent

by pressure above, as for the operation of bleeding. The tip of the needle point being brought into the axis of the vein, the piston is slowly pushed, and the whole four fluid drachms of defibrinated blood gently added to that in the venous system of the patient. As the instrument is withdrawn, the finger-tip is placed over the orifice, and kept there for a few minutes.

As many charges of the syringe may be inserted as the surgeon may deem necessary, at the same or different points.

SECTION VI.

DISEASES OF THE AREOLAR TISSUE.

Cellulitis, or *Inflammation of the Areolar Tissue*, may be *circumscribed* or *diffused:* in the former case it gives rise to an *abscess*, and in the latter to *diffused suppuration.* When depending upon an erysipelatous taint, it constitutes *cellular erysipelas.**

Elephantiasis Arabum.—Under the term elephantiasis, two dissimilar diseases have been confounded. One, the elephantiasis, so vividly described by Aretæus, the *Elephantiasis Græcorum*, which begins by tubercular swellings of the face; the other, the *Elephantiasis Arabum*, which we propose to describe here. It consists in a slow hypertrophy of the skin, areolar tissue, and bones, and in their infiltration with a peculiar cacoplastic deposit. The epidermis is thickened and the papillæ enlarged, *but not much:* the true skin is immensely thickened: its fibrous structure dense and almost rigid: the areolar tissue thickened, its areolæ expanded, and filled with oily or gelatinous-looking stuff. In cases which have been examined, the microscopical appearances were those of hypertrophy of the tissues involved. The bones also of the affected limb become enlarged and heavy.

This is peculiarly a disease of warm climates. The dark races are more liable to it than the fair. In India, it is particularly liable to attack the scrotum, which it converts into a huge tumor.

---

* See Erysipelas and its treatment, vol. 1.

In the West Indies the leg is its favorite seat, hence the term *Barbadoes leg*.

The best description of it is that given by Mr. Dalton, an able practitioner of Guiana; and from this it plainly appears, that it is from the first a constitutional malady. It begins insidiously with feverish or aguish symptoms, pain in the leg about to be attacked, firm doughy swelling resembling that of *phlegmasia alba dolens*, and some tenderness of the lymphatic glands. In the course of months, or perhaps of years, the patient suffers a frequent repetition of these attacks; the limb becomes permanently swelled, and in confirmed cases presents a huge, misshapen, useless mass, like the leg of an elephant; hard, and almost insensible to the touch, yet painful. A fetid serous discharge is liable to ooze from the skin; or ulcers may form, and if not very extensive, may diminish the pain, and seem to eliminate a something noxious.

Treatment.—The extreme rarity of this disease and the few opportunities afforded homœopathic physicians for investigating its peculiarities and comparing the pathogeneses of their remedies in effecting a cure, has prevented the recommendation of any particular line of treatment in this disease. The remedies that are worthy of consideration in controlling, if not checking the progress of the affection, may be mentioned as follows: *Arsenic*, *Apis mel.*, *Clematis*, *Graphites*, *Iodine*, *Lycopodium*, *Mercurius*, *Sulphur*, and *Thuya*. The *Hydrocotyle Asiatica* is esteemed as a remedy of great value in the treatment of this disease. It is a plant native of Asia as its name indicates and its provings published in the British Journal of Homœopathy, vol. xvi, p. 461, certainly show an elective affinity for the skin. "Lepra tuberculosa" which is an European disease and closely allied to the affection under consideration, has been said to have yielded to the remedy more than once. Whenever occasion permits, I shall not fail to employ this agent of such accredited value. If the disease has been seen too late and the limb has acquired such enormous proportions as to threaten the bursting of the skin, a few punctures should be made with a sharp-pointed scalpel or bistoury, and the serum permitted to escape through the artificial openings thus made. When all

other things have failed, the knife of the surgeon may be used as a dernier resort.

SECTION VII.

DISEASES OF THE LYMPHATIC SYSTEM.

Angeioleucitis or Lymphangeitis (*Inflammation of the Lymphatic Vessels, or Absorbents*) may occur as an idiopathic affection, as a complication of erysipelas, or as the result of the irritation produced by a wound, ulcer, or local inflammation, as in cases of gonorrhœa. Its occurrence is usually preceded or accompanied by marked constitutional disturbance, rigors, and febrile reaction. If the inflamed lymphatics be superficial, their course will be marked by a number of fine lines, which soon coalesce into a band about an inch wide, of a *vivid red color*, running from the point at which the disease originates, to or beyond the nearest lymphatic glands, which are always themselves inflamed. The line of the absorbents is somewhat doughy, and not very tender, and the limb is usually swollen and often erythematous. If the inflammation affect only the deep lymphatics, the affection of the glands may alone be perceptible. *Resolution* usually occurs in the course of a week or ten days, though suppuration often takes place in the glands, and sometimes in the lymphatics themselves; the prognosis is favorable, though death may occur from the supervention of erysipelas, pyæmia, or diffuse cellulitis. The only disease with which angeioleucitis is likely to be confounded is *phlebitis*, from which it may be distinguished by observing that the red line in the latter affection has a *dusky hue*, and gives a peculiar, cord-like and knotty sensation to the touch.

The *treatment* consists in the internal and external use of *Aconite* during the acute stage; when the more active symptoms have subsided then *Belladonna*, *Baryta*, *Conium*, *Dulcamara*, *Hepar sulph.*, *Lycopodium*, *Lachesis*, and *Mercurius*, will produce good results; compresses wet with a strong *Aconite* solution or fomentations of *Hamamelis* wrung out in hot water and laid over the affected part will meet the requirements of the case; should suppuration threaten the remedies employed for that

condition will answer a good purpose, and the local applications of poultices medicated with the proper remedy will become important auxiliaries in the treatment of the case. When pus has been formed it should be promptly evacuated by free incisions, and treated as simple abscess.

Adenitis, or *Inflammation of the Lymphatic Glands*, always accompanies angeioleucitis, but may also occur independently, as the result of transmitted irritation (as in sympathetic bubo), or of the absorption of morbid matter (as after poisoned wounds, or in chancroidal bubo), or as the result of direct violence, or of over-exertion in walking or otherwise. The symptoms of adenitis are those of circumscribed, deep-seated inflammation in general, terminating sometimes in resolution, but more often in suppuration, or in chronic induration and hypertrophy.

Treatment.—The remedies which have acquired the greatest amount of success in the treatment of enlarged lymphatic glands are *Sulphur*, *Calcarea* and *Silicea*, in one class; *Rhus*, *Dulcamara*, *Iodine*, *Ammonia*, *Conium*, *Mercurius*, in the other. The first class are the remedies appropriate to scrofulous diathesis generally, the latter when a local affinity for the glands is chiefly desired in the remedy. *Rhus* is highly spoken of by Hartmann when the inflamed gland acquires a strong hardness. He gives a single dose of a high dilution and allows it to act for a long time. Teste extols *Rhus* in the second potency frequently repeated as a primary remedy in all cases of scrofulous glands. He follows it with *Mercurius* and *Sulphur*, stating that the latter medicine, if given first instead of last will begin but not complete the cure. He also suggests, on theoretical grounds, *Cistus canadensis* as a remedy to be considered.

In the Leopoldstadt Hospital at Vienna, *Clematis* is the favorite remedy for enlarged lymphatic glands and Dr. Madden states that he has had excellent results follow the use of the *Arseniate of Soda* in the first trituration. I have used most of these remedies, but not with the satisfactory results mentioned, in this disease and have succeeded better with the preparations of *Iodine*, such as the *Iodide of Mercury*, *Iodide of Potassium*, *Iodide of Calcium*, and in one or two cases I succeeded beyond my expectations with the sixth trituration of the *Iodide of Arsenic*.

Ammon. mur., *Calc. phosph.*, and *Phytolacca* in a case dependent upon a syphilitic dyscrasia, cured this affection in one instance. Pure air, good nourishing diet with moderate exercise, and plenty of sunlight, in conjunction with the treatment given, with cod-liver oil and the hypo-phosphates of lime and soda, and the general treatment recommended for Tuberculosis, vol. 1, page 372, will oftentimes produce good results.

The lymphatic glands are affected in *tuberculosis*, in *scrofula*, and in *syphilis*, and are frequently the seat of various morbid growths, particularly the *adenoid*, and those of a *malignant* nature. The *treatment* appropriate to these various conditions has already been described.

Varicose Lymphatics.—A dilated or varicose condition of the lymphatic vessels has been occasionally met with, and may form a troublesome complication in cases of Arabian elephantiasis. By spontaneous rupture, or accidental wound, a fistulous opening may be formed, through which the lymphatic fluid escapes, constituting the disease known as *Lymphorrhœa*. The *treatment* consists in the application of caustic, and in the use of pressure, and the treatment above recommended.

Lupus.—Under this name are included two affections which may be described as *Lupus Non-exedens*, or *Simple Lupus*, and *Lupus Exedens*, or *Ulcerating Lupus*.

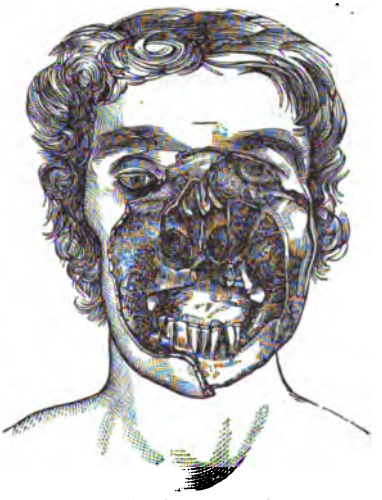
Lupus Non-exedens appears as a red patch on the skin (usually of the face), attended with brawny desquamation, and sometimes accompanied with indolent tubercles. It runs a very chronic course, and produces inconvenience merely by the deformity and scar-like contraction to which it gives rise. It is usually seen in persons of a scrofulous diathesis. The *treatment* consists in the administration of constitutional remedies,* cod-liver oil, *Arsenic*, *Mercurius jod.*, and in the local use of a solution of nitrate of silver, or the acid nitrate of mercury.

Lupus Exedens, *Ulcerated Lupus*, or *Lupus Ulcer*, is usually seated on the tip or alæ of the nose, but sometimes on the upper lip, or in other situations, and is chiefly seen in young persons. It begins as one or more reddish papules, or tubercles,

* See Scrofulosis and its treatment, vol. 1, p. 372.

which soon ulcerate and coalesce. The lupous ulcer may be *superficial*, when it appears as a fungous, warty, ulcerated surface, with prominent nodular granulations, which are often scabbed over by the drying of the discharge, and are sometimes, irritable, though seldom disposed to bleed. The ulceration progresses under the scabs, and the affection is liable, at any moment, to assume the *deep*, or *phagedænic* form, which was known to the older writers as *noli-me-tangere*. Fig. 451.

Fig. 451.



Phagedænic lupous ulcer.

The phagedænic lupous ulcer is a very painful affection, attended with great destruction of tissue, and accompanied with a fetid discharge. Under its influence, the greater part of the nose may melt away, as it were, in the course of a few weeks, and it is to be observed, that when the ulcer has reached the level of the rest of the face, it may become at least temporarily arrested. The affection rarely proves fatal by itself, and cicatrization may occur, adding to the deformity caused by the disease, by inducing contraction and distortion of neighboring parts. The *treatment* of the superficial form consists in the administration of *Arsenic*, *Causticum Cicuta*, *Carbolic acid*, *Staphysagria*, *Iodine* and *Mercurius*, and in the local use of a solution of nitrate of silver, diluted tincture of iodine, or dilute citrine ointment. The phage-

dænic variety requires the application of caustics, or of the actual or electric cautery, together with the constitutional treatment already recommended. Excision may be resorted to in certain situations, as the upper lip, the resulting gap being closed by a plastic operation, if necessary. Lupus, complicated with a syphilitic taint, requires the administration of the iodide of potassium, and the *mercurial* preparations. In fact, *Arsenic* in my hands has proved the best remedy and the only remedy of any curative value of all those mentioned both in the benign and malignant varieties.

Rodent Ulcer.—This affection, which is also known as *Jacob's Ulcer*, is most often seen in the eyelids, cheeks, upper lip, nose, or scalp, but may also occur in other parts of the body. It is a disease of late adult life, and commonly originates in some tubercle or mole, which may have existed for many years. It is usually single, at first rounded, but becoming irregular as it spreads, with indurated base and edge, and a somewhat abrupt, and but slightly elevated border; it very rarely assumes the character of a tumor. The ulcerated surface is smooth, glossy, and dry, and of a reddish-yellow color. The progress of the disease, though extremely indolent and chronic, is never spontaneously arrested, though partial cicatrization may sometimes occur. The rodent ulcer produces frightful ravages, exposing the orbit, nasal cavities, pharynx, or even the brain, and thus ultimately causing death—though the local character of the affection is strictly maintained to the last, the lymphatics and distant organs never becoming involved. The microscopic characters of the rodent ulcer are, according to Paget, simply those observed in ordinary granulations; Collis classes the disease among myeloid or fibro-plastic growths, while Moore, on the other hand, looks upon it as a form of cancer. The *treatment* consists in complete extirpation, which is best accomplished, when possible, with the knife. If, however, excision be contra-indicated by the size or locality of the ulcer, or the age of the patient, caustics may be employed, the Vienna, or Canquoin's paste, or nitric acid, or acid nitrate of mercury, being respectively preferred, according to the deep or superficial character of the affection.

Injuries of the Lymphatics present, ordinarily, no features requiring special comment; in some cases, however, in which there is a varicose state of the lymphatic trunks (a condition usually associated with one of the varieties of elephantiasis arabum), wounds of the affected part are followed by a copious and sometimes troublesome flow of a milky fluid, constituting a traumatic form of what is known as *lymphorrhœa*. Such wounds are difficult to heal, and sometimes degenerate into obstinate fistulæ, which must be treated on the same general principles as fistulæ in other portions of the body.

Injuries of the Bursæ are chiefly of interest from the possibility of their being mistaken for injuries of adjoining articulations. Wounds of bursæ heal with obliteration of the sac. Should suppuration occur in a bursa, without external wound, the part should be freely opened, and treated as an ordinary abscess.

Hypertrophy of a Toe-Nail, usually of that of the great toe, is occasionally met with, the laminæ of the nail becoming distorted, and constituting a horn-like protuberance, which may grow so large as to interfere with walking. The *treatment* consists in avulsion of the nail, which operation usually effects a permanent cure.

Keloid or *Cheloid* (*of Alibert*) is an affection met with chiefly, if not exclusively, in the scars produced by burns or wounds, and especially in those produced by flogging, and is to be distinguished from the disease known as *Morphæa* or the *Keloid of Addison* (true keloid), which occurs in healthy skins, where it produces a scar-like appearance. The former appears in the shape of small and shining, indurated elevations, of a dusky red color, which extend, sending out, as it were, claw-like processes, and are attended during their growth by great itching and considerable pain. In their structure they correspond with *fibro-cellular outgrowths*. The *Keloid of Addison* begins as a "white patch or opacity" of the skin, surrounded by a zone of redness, gradually spreading and inducing contraction of fasciæ and tendons, and giving a "hide-bound" character to the part affected. The *treatment* of either form of keloid is very unsatisfactory. Extirpation with the knife has been tried, but the disease almost invariably recurs.

Dr. Addison derived advantage from the use of *Iodine*, both internally and externally, in one case of the variety of the disease known by his name.

SECTION VIII.

INJURIES OF VEINS.

Subcutaneous rupture of veins occasionally occurs as a consequence of external violence, and is manifested by the extravasation of a large quantity of blood, which is, however, usually absorbed again in the course of a few days; or the blood may coagulate, the clot subsequently exciting suppuration, or it may possibly become organized. More rarely, the blood may become encysted in a fluid state, constituting what is sometimes called a venous aneurism.

Open wounds of veins are not unfrequently met with in civil practice, and occasionally give rise to the most serious consequences.

Hemorrhage from a wounded vein is marked by the even and rapid flow, and the dark color of the effused blood. In certain situations, as at the root of the neck, or under peculiar circumstances, as when veins are affected by varicose disease, the hemorrhage may be so profuse as to endanger life. Wounds of the internal jugular vein are indeed extremely fatal accidents, eighty-five cases collected by Dr. S. W. Gross having been followed by death in no less than thirty-seven instances. Hemorrhage from superficial veins can usually be readily controlled by pressure, by position, styptics, and the remedies recommended under the treatment of Arterial Hemorrhage; also, see Hemorrhage from Wounds, vol. 1, p. 625. Thus the most profuse bleeding, from rupture of a vein in a varicose ulcer of the leg, may often be checked, simply by elevating the limb. The large superficial veins on the back of the hand are often wounded by accidents from broken glass; in such cases it is a good plan to transfix both ends of the bleeding vessel with a metallic suture, thus arresting the hemorrhage and closing the wound at one and the same time. In any case in which pressure cannot conveniently be applied, the surgeon should not hesitate to use a ligature. There was formerly a great prejudice against the practice

of tying veins, from the supposition that it was liable to induce pyæmia, but now that modern researches have shown that there is no necessary connection between that process and inflammation of the veins or phlebitis, the theoretical grounds for opposition are removed, and it is established by clinical observation that the risks of tying veins are much less than was formerly believed. The *lateral* ligature, which was first practiced by Mr. Travers in a case of wound of the femoral vein, consists in pinching up the bleeding orifice, and throwing around it a delicate ligature, so as not to obliterate the calibre of the vessel; this plan, which has theoretical merits, is found in practice to be very apt to be followed by secondary hemorrhage, so that it is now generally abandoned, the vein being tied as an artery, above and below the bleeding point. The process by which nature arrests bleeding from a vein is essentially that which has been described in speaking of wounded arteries, a clot forming in the vessel, and the cut edges subsequently uniting through the development of local inflammatory changes. After ligation, which corrugates but does not divide the coats of the vein, a clot forms on the distal side of the ligature, which gradually cuts its way through, as in the case of an artery, though in a shorter time in proportion to the size of the vessel.

Entrance of Air into Veins.—The most frightful and fatal consequences of venous wounds, though fortunately one which is rare, is the entrance of atmospheric air, and its transfer to the heart. This accident is principally met with in cases of wound of the internal jugular, or of the other large veins situated at the root of the neck, or in the axilla, and this part of the body is accordingly often spoken of by surgeons as the "dangerous region." It has, however, occurred in other parts of the body: thus, in a case of the late Prof. Mott's, serious though not fatal symptoms followed the entrance of air into the facial vein where it crosses the lower jaw, while this accident occurring in the femoral vein is supposed to have been the cause of death in a case of thigh amputation during the Crimean war.* The mode in

* It is probable, also, that the entrance of air into the uterine veins is an occasional cause of sudden death after delivery, and after various operations upon the womb. (See an able paper by Dr. Greene, of Dorchester, in *Amer. Jour. of Med. Sciences* for Jan., 1864, pp. 38–65.)

which air is pumped into the veins is easily understood: during the act of inspiration, a vacuum is created in the thorax, to supply which air rushes through the trachea or through any other opening into the interior of the chest; thus, in the case of wounds of the pleura, air is sucked in during inspiration, to such an extent as often to induce collapse of the lung and pneumothorax, and in the same way, if a large vein in the neighborhood of the thorax be wounded, and be prevented from collapsing by the natural connections of the part, by the position of the patient, or by a structural change in the vessel itself (to which the French give the name of *canalization*), the act of inspiration will mechanically and necessarily pump air into the open vein, precisely as it does through any other aperture into the chest. The *local signs* of entrance of air into a vein, consists in a peculiar sound, variously described as of a *hissing*, *gurgling*, *sucking*, or *lapping* character, and in the appearance of frothy bubbles in the wound. The *constitutional symptoms* are equally well marked. The patient cries out, impressed with a sense of certain and rapidly impending death, and falls almost instantly into a semi-collapsed state, moaning and perhaps struggling; the pulse is almost imperceptible, the action of the heart tumultuous but feeble, and the respiration difficult and oppressed. Death may occur immediately, but more commonly after an interval varying from a few minutes to an hour or more; or, if the quantity of air introduced be but small, recovery may gradually ensue, partial paralysis sometimes continuing for several hours or even a much longer time subsequent to the accident.

The *cause of death* in these cases is somewhat obscure; Mr. Erichsen believes it to be the frothy condition of the blood, produced by the action of the heart, which prevents the due transfer of the circulating fluid through the pulmonary tissue, and thus secondarily causes a deficient supply of blood to the brain and nerve centers, inducing death by syncope. Sir Charles Bell believed that death was caused by the direct transference of air to the base of the brain, and, in confirmation of this view, Prof. Gross's observation may be referred to, viz., that animals may be rapidly killed by the injection of air into the carotid artery. Mr. Moore maintained that death was due to the entrance of air

to the heart, impeding the action of the cardiac valves and thus stopping the circulation; while Dr. Cormack attributed the fatal result directly to paralysis of the right side of the heart from gaseous distension.

Treatment.—As a *preventive* measure, the surgeon should exercise extreme caution in all operations about the root of the neck, or deep in the axilla, using as much as possible the handle instead of the blade of his knife. It might also be desirable to have the large veins compressed by an assistant, or protected by serre-fines, between the seat of the operation and the heart, and care should be taken not to place the veins in such a position as will prevent them from collapsing if wounded, whether by stretching the patient's head to the opposite side, by hastily elevating the shoulder, or by incautiously lifting a tumor from its bed. Mr. Erichsen recommends that the patient's chest should be swathed by a firm and broad bandage, as a precautionary measure, so as to limit as far as possible the depth of the inspirations. Should a large vein in the "dangerous region" be wounded during an operation, or should the surgeon find such wound in a case of cut throat, etc., measures should instantly be taken to prevent the entrance of air, by the application of ligatures above and below the aperture. When this alarming accident has actually occurred, the first indication for treatment is obviously to prevent any further ingress of air, by making instant compression and then quickly applying a ligature. The subsequent treatment must consist chiefly in endeavoring to keep up the action of the heart by appropriate means. Of these, the most promising appear to me to be artificial respiration and the administration of stimulants. The patient should be in the recumbent position, and the extremities elevated so as to retain as much blood as possible in the central organs; to accomplish the same purpose, Mercier advised the application of tourniquets and compression of the abdominal aorta. Artificial respiration may be practiced with suitable bellows, or simply by the surgeon's mouth. Sylvester's or Hall's method would scarcely be applicable in these cases, on account of the situation of the wound. Various plans have been suggested, among which may be mentioned: 1. An attempt to suck out the air by means of a canula introduced into the wounded

vein, into the right jugular vein, or even into the heart itself; 2, bleeding from the right jugular vein or from the temporal artery; 3, tracheotomy; and 4, the injection of warm water into the heart. I am not aware, however, that there are any cases on record which prove the efficiency of any of these methods. Galvanism might rationally be applied to the cardiac region, though I should be disposed to trust more to the use of stimulants and to artificial respiration.

Remote Consequences of Injuries of Veins.—A clot may form in a vein as the result of injury (*thrombosis*), and may subsequently undergo disintegration, the fragments being carried to the right side of the heart and thence to the lungs, plugging the minute pulmonary arteries (*embolism*), and thus giving rise to the formation of what are commonly but incorrectly called metastatic abscesses. This condition, which is in no degree necessarily connected with phlebitis, is referred to in the chapter on Pyæmia.

On the other hand, a clot in a vein may undergo a process of gradual contraction, induration, and decolorization, becoming finally calcified, and constituting what is called a *phlebolite* or *vein-stone*. These phlebolites, however, usually result from clots due to stagnation, without external violence, and are consequently chiefly met with in the veins of the pelvis, genital organs, and lower extremities.

SECTION IX.

INJURIES OF ARTERIES.

Contusion of an artery may exist, without giving at first any evidence of its occurrence. The secondary results of arterial contusion depend upon the severity of the injury; if this have been very great, a portion of the wall of the vessel may slough, and cause secondary hemorrhage or extravasation; if the violence have been less, the vessel may undergo obliteration, or in very slight cases may recover without evil consequences. The obliteration of an artery, occurring some hours or days after the reception of an injury, is usually attributed to the effect of

inflammation; I believe, however, that it is more commonly *due* to the plugging of the vessel, either by embolism (fragments of clot being carried from another part of the circulation), or more rarely to an actual thrombosis *in situ*, clotting taking place in the injured vessel itself. As a result of this obliteration, or *infarctus*, as it is called by French writers, gangrene or serious visceral degeneration may occur, according to the size and situation of the vessel. Thus, in two cases of injury in the lumbar region, Dr. Moxon found complete thrombosis of the renal arteries, with corresponding incipient degeneration of the kidneys. The treatment is the same as in Contused Wounds, vol. 1, p. 644.

Rupture or laceration of an artery may be either partial or complete; *partial laceration* generally occurs without external wound, and involves the two inner coats of the artery, the elasticity of the outer coat preserving it from injury. This accident may form the starting-point for the development of an aneurism at a subsequent period; or the torn inner coats of the vessel curling upon themselves, may furnish a nidus for the occurrence of coagulation, which, as in the case of contusion, may cause gangrene of the part below the seat of injury; or, again, the lacerated inner coats may turn downward, and by their mechanical valvular action produce gangrene, by directly interfering with the circulation. *Complete rupture* of an artery may occur subcutaneously, or in an open wound. In the latter case, the nature of the accident may be obvious from the profuse arterial bleeding, though in other instances, if the coats of the vessel are twisted upon themselves, there may be scarcely any hemorrhage, the artery, perhaps, hanging out of the wound and pulsating, and yet no blood escaping. When an artery is torn across subcutaneously, there may be wide-spread extravasation, or the development of one or other form of traumatic aneurism, according to the size and position of the vessel. The treatment will be conducted on the same general principles laid down in the consideration of Lacerated Wounds, vol. 1, p. 638.

Wounds of Arteries.—Non-penetrating wounds of arteries occasionally, but very rarely, occur. In these, the external coat is divided, with, perhaps, a portion of the middle coat.

There is no primary hemorrhage in these cases, but the inner coat almost invariably yields after a few days, when fatal bleeding may ensue. Hence, a partially divided artery should always be ligated, as a precautionary measure.

Penetrating wounds of arteries, if very small (consisting of a mere puncture with a fine needle), may not be productive of evil consequences; but if the puncture be larger, as with a tenaculum, secondary if not primary hemorrhage will almost certainly follow. Incised wounds of arteries bleed more or less freely, according to the size and direction of the wound: thus, a longitudinal wound will, in consequence of the anatomical arrangement of the arterial coats, gape less, and consequently bleed less than one which has an oblique direction, while a transverse wound will bleed more than either. An artery which is completely cut across bleeds less, other things being equal, than one which is only partially divided; for the complete section of the vessel allows partial retraction and contraction to occur, and thus measurably lessens the size of the stream. A wound of an artery at the bottom of a narrow and tortuous passage through muscular or other tissue, approaches to the nature of a subcutaneous laceration, and extensive extravasation may then occur with very little external bleeding; or the outer wound may actually heal, while the opening in the vessel remains patulous, in which case a form of traumatic aneurism may be developed.

Hemorrhage from a wounded artery may usually be recognized by the bright vermillion hue of the effused blood, and by the fact that it is thrown out in jets corresponding to the pulsations of the heart, and does not flow in an even stream, as in cases of hemorrhage from veins. To this rule there are, however, exceptions; the blood from the proximal end of a divided artery, always, I believe, presents the characters which have been described, but from the distal end, for at least an hour after the infliction of the wound, or until the collateral circulation has been established, the flow of blood resembles that from a wounded vein. In other cases, however, if the anastomosis be very free, as in the palmar arch, both ends of the cut vessel will bleed in jets, and pour out blood of a bright red color. The force of the jet varies with the size and position of the artery, and the strength

of the heart's action. A small branch wounded in close proximity to a main trunk, may bleed more furiously than a larger vessel divided at a more distant point, and, in general terms, the nearer a cut vessel is to the centre of circulation, the more profusely will it bleed. As the pulsations of the heart become weaker, the jet of blood has less force, and may finally cease with the occurrence of syncope, or may be arrested by the natural processes of contraction and retraction, which are set up in the wounded vessel.

As already indicated, there may be profuse bleeding without any external loss of blood. When bleeding occurs into one of the cavities of the body, as the peritoneal, it constitutes *internal* or *concealed hemorrhage;* when into the areolar tissue of a part, it is known as *extravasation.* Extravasation may prove directly fatal, by the amount of blood abstracted from the general circulation, may cause gangrene by pressure, especially upon the neighboring venous trunks, or, if circumscribed, may give rise to a form of traumatic aneurism.

Constitutional Effects of Hemorrhage.—These are the same kind, though differing in intensity, whether the bleeding proceed from arteries or veins, and whether the hemorrhage be apparent or concealed. The first effect of profuse hemorrhage is shown in the blanching of the surface; the cheeks and lips become pale, and the conjunctiva unnaturally white. The pulse becomes small and rapid, the heart endeavoring by increased action to compensate for diminished power. The patient feels languid; the respiration assumes a sighing character; the senses of sight and hearing are perverted, being sometimes preternaturally acute, but more often dulled; the temples throb, the skin becomes cold, and at last, rather suddenly, the patient faints. During the state of syncope, the heart's action is very feeble, and the breathing almost entirely diaphragmatic. Death may occur in this condition from a continuance of the hemorrhage, but more commonly coagulation takes place in and around the mouth of the wounded vessel, and when consciousness returns, the bleeding is found to have spontaneously ceased. Vomiting frequently occurs as a syncope passes off All the tissues of a patient who has lost much blood, appear soft and flabby, probably from th

loss of the natural fluids of the part, which are rapidly absorbed into the depleted blood-vessels. Profuse or repeated hemorrhage, besides the symptoms which have been above described, often give rise to distressing nervous phenomena, such as amaurosis, delirium, convulsions, or even hemiplegia. Death has been attributed to a cerebral clot, which the autopsy showed did not exist, the fatal result being simply and altogether owing to profuse and repeated secondary hemorrhages. In recovering from the effects of loss of blood, the patient sometimes passes through a condition of constitutional irritation, with extreme restlessness and delirium, to which the name of *hemorrhagic fever* has been not inaptly applied.

The amount of blood which can be lost without serious consequences ensuing, varies greatly in different individuals. Infants and very old persons are, as a rule, more injuriously affected by hemorrhage than those in middle life. The amount of blood lost in ordinary childbirth might produce serious consequences under different circumstances, while, on the other hand, the mental state of a patient, as of one who has attempted suicide, or who believes himself to be bleeding to death, may actually cause a fatal result after the loss of a really insignificant quantity of blood.

Habitual or *Periodic Hemorrhage* may be met with in either sex. In the female it may take the place of, or alternate with, the natural menstrual flow, when it constitutes what is called *vicarious menstruation*. In the male sex, bleeding from the hemorrhoidal veins sometimes occurs at certain periods of the year, and seems to be occasionally beneficial by relieving a state of plethora. Some persons bleed habitually from the nose, without any apparent solution of continuity having taken place; and Mr. Moore mentions an apparently authentic case, in which a young woman had severe spontaneous hemorrhages from the skin of the finger. In these cases the blood seems to ooze from numerous minute orifices, and subsequently to collect in the form of drops, which then flow over the surface.

Hemorrhagic Diathesis.—This is the name used in England and in this country for the remarkable affection which the French call *Hemophylie*, and the Germans *Hæmophilie* or *Bluter-*

krankheit. Its chief manifestation, and that from which its name is derived, is a disposition to profuse bleeding, which may be spontaneous, or may follow upon the slightest wounds. It is often hereditary, and those in whom it exists are in childhood often subject to affections of the joints, and to inflammations of the lungs. The disease appears to depend on a peculiar condition of the blood (not mere want of plasticity, for it coagulates readily when removed from the body), and on a defective contractility of the arteries and capillaries. The hemorrhages which follow wounds do not yield so readily to constitutional measures as the above, and in these cases long-continued pressure, and the use of styptics, appear to be the most promising modes of treatment. The existence of the hemorrhagic diathesis would of course be a contra-indication to the performance of any operation involving the use of the knife; it is somewhat remarkable, however, that cases which have proved fatal, from this cause, have almost invariably been those of trivial accidental wounds, or of such slight surgical procedures as the extraction of a tooth, or lancing the gum—the only recorded instance, so far as known, of the hemorrhagic diathesis having caused death after an important operation, being in a case of lithotomy reported by Mr. Durham.

Treatment.—The treatment of arterial hemorrhage should be both *local* and *constitutional*. The *constitutional treatment* consists in keeping the patient quiet, in a recumbent position, and in avoiding any sudden elevation of the head or of the arms, which might induce fatal syncope. Food and stimulants should be cautiously administered in small quantities at a time, and, if there be vomiting, may be given by enema. The following remedies may be given internally, according to their several indications: *Aconite*, *Arnica*, *Belladonna*, *Crotalus*, *China*, *Cerasus*, *Crocus*, *Erechthites*, *Erigeron*, *Gossypium*, *Hamamelis*, *Nitric acid*, *Ferrum*, *Ipecac*, *Phosphorus*, *Sabina*, *Secale*, *Senecis*. In cases of hemorrhagic diathesis, *Secale* and *Gossypium* have done me good service. Debility after great loss of blood can be overcome by *China*, *Ipecac* and *Verat. alb.* As a last resort, *transfusion of blood* should certainly be tried, in the manner and with the precautions recommended on page 829. The

statistics of this operation in cases of hemorrhage, as given by Landois, are very favorable, ninety-nine cases having afforded not less that sixty-five recoveries, while eleven of the thirty-one fatal cases (the result in three was doubtful) were moribund at the time transfusion was practiced. The loss of blood in some cases is never entirely repaired during life, the patient remaining permanently blanched, though otherwise apparently in good health; or the debility resulting from hemorrhage may act as a predisposing cause for the occurrence of tuberculosis or other morbid condition.

The *local treatment* of arterial bleeding consists in the adoption of various measures, which may be either of a *temporary*, or of a *permanent* nature.*

SECTION X.

SUBSTITUTES FOR THE NATURAL LIMB.

After the healing of a stump, the surgeon should make it his duty to direct the patient in the attainment of some useful substitute for the portion which has been removed. This must, of course, vary with his social condition.

For the arm of the laboring man, a cap formed of strong leather, to which an iron hook can be attached, and which can be made to strap on to the stump, will answer the purposes of prehension: while patients of larger incomes can obtain excellent substitutes for the arm and hand from various ingenious mechanics. In numerous instances, artificial arms have been made by means of which the patient was able to grasp his hat and hold a pen or other light articles by a neat mechanism that caused the fingers to approach the palm of the hand.

Many varieties of artificial legs can also be readily obtained, in which the support is furnished by a graduated pressure around the stump, and I fully coincide with the sentiment that every homœopathic surgeon, in accordance with the sentiments expressed by the American Medical Association against this variety of charlatanism, will abstain from recommending

* See Hemorrhage from Wounds, vol. 1, p. 625.

limbs which are patented. Those of Kolbe have been made in accordance with the special directions of a competent surgical authority, are light, neat, possess every movement, are cheap, and manufactured with the distinct understanding that the crippled sufferers from amputation shall not be subjected to the evils caused by taking out a patent.

As a general rule, few stumps will be able to sustain the pressure arising from the constant use of a peg or an artificial limb under ten weeks after the entire healing of the wound, even when the stump is well soaked every night in a strong decoction of white-oak bark or diluted lime-water to harden the skin. In the best formed artificial limbs, although the main support is borne by the limb above the stump, yet the strain thus put upon the newly-formed cicatrix is also very apt to induce ulceration, and this, when repeatedly established, becomes very difficult to heal. It will therefore prove desirable to omit the use of all artificial support for about three months, and then, on the appearance of increased redness in the stump, to intermit the use of the limb until the congestion of the skin has passed away. The anxiety of patients to try their artificial limbs will often create so much irritation in a newly-formed stump as to require that the movements should be regulated by the surgeon, before ulceration or sloughing of the stump is induced by ignorance or imprudence.

THE END.

INDEX TO SCIENCE AND ART OF SURGERY.

A

PAGE.

Abdomen, contusions of..... 174
Abdomen, injuries of. 174
Abdomen, non-penetrating wounds of..... 175
Abdomen, penetrating wounds of..... 176
Abdominal abscess..... 735
Abdominal abscess, treatment 735
Abscess of the antrum..... 573
Abscess, arthritic..... 58
Abscess of the brain..... 143
Abscess, biliary..... 735
Abscess of the gums..... 565
Abscess of the liver..... 608
Abscess of the testicle..... 653
Abscess, openings of..... 827
Absence of the uterus and ovaries..... 715
Absorption of cataract..... 525
Accumulation of wax in the ear 543
Acupressure for aneurisms.... 216
Adenitis..... 833
Affections of bursæ..... 108
Affections of bloodvessels..... 191
Affections of muscles..... 108
Affections of tendons..... 108
Air, entrance of into veins.... 839
Air passages, wounds of.....162
Amputations..... 765
Amputation of the arm..... 785
Amputation at the ankle..... 804
Amputation, affections of stump after..... 812
Amputation of the breast..... 600
Amputation, causes of death after..... 820
Amputation, Chopart's..... 805
Amputation at the elbow..... 786
Amputation of the forearm.... 788
Amputation of the fingers..... 793
Amputation at the hip joint... 794
Amputation at the knee joint.. 800
Amputation of the leg..... 802
Amputation of the metacarpus 790
Amputation through the metacarpus. 793
Amputation of the metatarsal bones..... 807

PAGE.

Amputations, mortality after.. 814
Amputation of the penis..... 655
Amputation, Pirogoff's..... 804
Amputation shoulder joint..... 782
Amputation " above 785
Amputation, subastragaloid... 805
Amputation, Syme's..... 807
Amputation, thigh..... 798
Amputation of the toes..... 809
Amputations, upper extremity 782
Amputations, lower extremity 798
Amputation of the wrist..... 789
Amputating knives..... 778
Anæsthesia in surgical operations..... 501
Anchylosis..... 69
Anchylosis, etiology of..... 70
Anchylosis, false..... 70
Anchylosis of the jaws..... 587
Anchylosis, Kolbe's apparatus for..... 74
Anchylosis, Stromeyer's apparatus for..... 74
Anchylosis, true..... 75
Anchylosis true, treatment of 77
Anchylosis from white swelling 65
Anchylosed joints, excision of 79
Ankle, amputation at... 804
Ankle, compound fracture of... 45
Ankle, fracture of..... 482
Ankle, dislocation of..... 838
Ankle, resection of..... 761
Aneurism, acupressure for..... 216
Aneurism, bandaging for..... 205
Aneurism, continued flexion for 212
Aneurism, digital compression for..... 211
Aneurism, dissecting..... 192
Aneurism, differential diagnosis 196
Aneurism, etiology of..... 197
Aneurism, false..... 191
Aneurism, galvano puncture.. 215
Aneurism, growth of..... 196
Aneurism, injections into tumor 216
Aneurism, manipulations for.. 214
Aneurism, pathology of..... 192
Aneurism, prognosis of..... 198
Aneurism, pressure for... 205
Aneurism, situation of..... 198

PAGE.

Aneurism, ligature for... 213
Aneurism of stump..... 813
Aneurism, spontaneous cure of 199
Aneurism, surgical treatment.. 205
Aneurism, symptoms of..... 193
Aneurism, true..... 191
Aneurism, treatment..... 199
Aneurism, varieties of..... 191
Aneurismal needle..... 219
Anomalous dislocations of hip 321
Anomalous dislocations of the shoulder..... 281
Apnea..... 588
Appliances for amputations... 780
Appliances for surgical operations..... 500
Arrest of hemorrhage after operations..... 504
Arthropyosis..... 48
Arthritis, acute..... 56
Arthritis, chronic..... 56
Arthritis, etiology of..... 56
Arthritis, symptoms of..... 56
Arthritis, treatment of..... 58
Arthritis, traumatic..... 38
Arteries, axillary, ligation of.. 230
Arteries, anterior tibial, ligation of..... 240
Arteries, arteria innominata.. 221
Arteries, brachial, ligation of.. 231
Arteries, common carotid, ligation of..... 222
Arteries, common iliac, ligation of..... 233
Arteries, circumflex iliac, ligation of..... 237
Arteries, carotid external, ligation of..... 226
Arteries, epigastric, ligation of 237
Arteries, external carotid, ligation of..... 226
Arteries, external iliac, ligation 236
Arteries, deep femoral, ligation 239
Arteries, facial, ligation of..... 227
Arteries, femoral, ligation of.. 238
Arteries, gluteal, ligation of... 235
Arteries, iliac common, ligation 233
Arteries, iliac circumflex, ligation of... 237
Arteries, iliac external, ligation 236
Arteries, iliac internal, ligation 235
Arteries, inferior thyroid, ligation of..... 230
Arteries, internal mammary, ligation of..... 229
Arteries, lingual, ligation of... 226
Arteries, occipital, ligation of.. 227
Arteries, peroneal, ligation of.. 242
Arteries, popliteal, ligation of.. 239

PAGE.

Arteries, posterior tibial, ligation of..... 240
Arteries, radial, ligation of.... 232
Arteries, rules for ligating 217
Arteries, sciatic, ligation of... 236
Arteries, subclavian, ligation of 227
Arteries, superior thyroid, ligation of..... 226
Arteries, temporal, ligation of. 227
Arteries, ulnar, ligation of..... 232
Arteries, vertebral, ligation of 239
Arteries, injuries of..... 842
Artificial anus..... 610
Artificial eyes..... 534
Artificial respiration..... 588
Ascites..... 723
Astragalus, dislocation of..... 344
Artragalus, resection of..... 762
Atrophy of the optic disk..... 539
Atropine, hypodermic injection 54

B

Baker Brown's operation for lacerated perineum..... 186
Bandaging for aneurisms..... 205
Barton's fracture of the radius 415
Billiary abscess 355
Bladder, malformations of..... 680
Bladder, extroversion of..... 690
Bladder, inversion of..... .. 685
Bladder, wounds of..... 180
Bladder, " symptoms of 181
Bladder, " treatment of 182
Blood, transfusion of..... 829
Blood vessels, affections of... 191
Bones of the foot, dislocations 344
Bones of forearm, dislocations 283
Bones of the hand, dislocations 294
Bones of the lower extremities dislocations of.... 300
Bones of the leg, fracture of... 470
Bones of trunk, dislocations of 257
Bones of upper extremities, dislocations of..... 266
Bones of leg, resection of..... 761
Brain, abscess of..... 143
Brain, compression of..... 142
Brain, irritation of.....132–134
Bronchotomy 590
Bubo and other tumors of the groin..... 622
Bunion..... 128
Bursæ, affections of..... 108
Bursæ, inflammation of..... 112
Bursæ, injuries of..... 837
Bursitis, acute..... 112
Bursitis, chronic..... 113
Bursitis, symptoms of..... 114

PAGE.
Bursitis, treatment..... 112
Bursitis, varieties of..... 114

C

Cæsarian section..... 733
Calcaneum, fracture of..... 483
Calculus, causes of..... 666
Calculus, cystine..... 663
Calculus, diagnosis of..... 668
Calculus, hardness of..... 665
Calculus, mixed or fusible..... 663
Calculus, number of..... 665
Calculus, oxalate of lime..... 662
Calculus, phosphatic..... 662
Calculus, prognosis of..... 668
Calculus, renal..... 663
Calculus, urinary..... 660
Calculus, uric acid..... 661
Calculus, varieties of..... 660
Calculus, vesical..... 664
Calculus, shape of..... 665
Calculus, situation of..... 666
Calculus, structure of..... 664
Calculus, symptoms of..... 667
Calculus, size of..... 665
Calculus, vesical, symptoms of. 667
Calculus, weight of..... 665
Caput obstipum..... 605
Carpal bones, fracture of..... 294
Cancer in the orbit..... 532
Cancer within the eye..... 532
Cartilages, diagnosis of..... 82
Cartilages, etiology of..... 81
Cartilages, false..... 80
Cartilages, movable..... 80
Cartilages, prognosis..... 82
Cartilages, semilunar dislocation of..... 331
Cartilages, symptoms of..... 81
Cartilages, treatment of..... 82
Castration..... 648
Catheterism of the eustachian tube..... 557
Cauliflower excrescence from the uterus..... 720
Causes of death after amputations..... 820
Causes of death after surgical operations..... 493
Causes of hernia..... 615
Cellulitis..... 830
Cheloid..... 837
Cerebral disturbance..... 130
Chest, wounds of..... 165
Chest, wounds, constitutional treatment of..... 170
Chest, wounds, local treatment of..... 169

PAGE.
Chest, wounds of lung..... 165
Chest, wounds of, non-penetrating..... 165
Chest, wounds of, pneumonia following..... 168
Chest, wounds of, symptoms of 165
Cheiloplasty..... 552
Choice of operation between laryngotomy and tracheotomy..... 594
Chopart's amputation..... 865
Circumflex iliac, ligation of.... 237
Cirsocele..... 620
Clavicle, dislocation of..... 260
Clavicle, fracture of..... 387
Clavicle, exsection of..... 752
Circular method of amputation 774
Club hand..... 737
Club foot..... 760
Colles's fracture..... 417
Colles's fracture, diagnosis of.. 418
Colles's fracture, prognosis....419
Colles's fracture, treatment.... 419
Colles's fracture, treatment, Hamilton's apparatus..... 420
Colles's fracture, treatment, Barton's method..... 422
Colles's fracture, treatment, Bond's method..... 423
Colotomy..... 645
Comparison of lateral and bilateral lithotomy..... 676
Complete occlusion of the anus 698
Complications with wounds of joints..... 39
Compression of brain, diagnosis of..... 133
Compression of brain, symptoms of..... 133
Compression of spine..... 153
Conditions requiring amputation..... 767
Common carotid, ligation of... 223
Common iliac, ligation of..... 233
Complete extirpation of tongue 562
Complete occlusion of the urethra..... 657
Compound fracture of ankle.... 45
Compound fracture of arm..... 411
Compound fractures of the condyles of humerus..... 410
Compound fracture of elbow.. 42
Compound fracture of hip..... 43
Compound fracture of knee.... 44
Compound fracture of patella. 470
Concussion..... 131
Concussion, symptoms of..... 131
Concussion, terminations of... 132
Concussion, spinal..... 153

PAGE.
Condyles of femur, fracture of 463
Congenital fissure of lower lip 556
Consent of patients to surgical operations 496
Contusions of the scalp 143
Contusions of the abdomen 174
Contusions of the abdomen, treatment 144
Contraction of the arm 737
Contraction of the buccal orifice 550
Control of hemmorrhage after operations 503
Contraction of the forearm 737
Contraction of the fingers 738
Contraction of the hip 738
Contraction of the knee 739
Contraction of the toe 746
Coronoid process, fracture of 431
Coxalgia, diagnosis of 90
Coxalgia, etiology of 85
Coxalgia, prognosis 93
Coxalgia, treatment 93
Coxalgia, treatment, mechanical 97
Crural hernia 621
Cysts of the antrum 574
Cystotomy 613

D

Death, causes of, after amputation 820
Definition of hernia 615
Deformity from dislocation 246
Deformity of the hand, arm and fingers 737
Deformity of the luxations 246
Deformity of the lower extremity 738
Dessault's dressing for fractured olecranon 427
Depression of the apex of nose 549
Depression of cataract 524
Depression of ridge of nose 549
Differential diagnosis of intra- and extra-capsular fractures 440
Diseases of joints 25
Disarticulations of ankle joint 805
Disarticulations of elbow joint 786
Disarticulation of fingers 792
Disarticulation of knee joint 800
Disarticulation of metacarpus 790
Disarticulation of phalanges 793
Disarticulation of shoulder 782
Disarticulation of thumb 791
Dislocations of ankle joint 338
Dislocations of ankle joint backward 340
Dislocations of ankle joint compound 343
Dislocations of ankle joint forward 339
Dislocations of ankle joint inward 341
Dislocations of ankle joint outward 342
Dislocations of ankle joint, varieties 339
Dislocations of astragalus 344
Dislocations of bones of forearm backward 283
Dislocations of bones of forearm forward 287
Dislocation of bones of the foot 344
Dislocation of metatarsal and tarsal 347
Dislocations of bones of lower extremity 300
Dislocations of the knee 329
Dislocations of the knee, compound 333
Dislocations of bones of trunk 257
Dislocations of bones of upper extremity 266
Dislocations, metacarpal bones 298
Dislocations of os cuneiform 297
Dislocations of the os magnum 297
Dislocations of the os pisiform 297
Dislocations, causes of 244
Dislocations, complete 243
Dislocations, complicated 243
Dislocations, componnd 252
Dislocations, consecutive 243
Dislocations, deformity from 246
Dislocations, diagnosis of 246
Dislocations, differential diagnosis 247
Dislocations and fracture 253
Dislocations, general symptoms of 245
Dislocations, incomplete 243
Dislocations, loss of function in 245
Dislocations, old 244
Dislocations, partial 243
Dislocations, pathology of 248
Dislocations, primitive 243
Dislocations, prognosis of 248
Dislocations, recent 244
Dislocations, reduction of 249
Dislocations, seat of 244
Dislocations, simple 244
Dislocations of tendons 111
Dislocations, treatment of 249
Dislocations, varieties of 243
Dislocation of carpal bones backward 294
Dislocation of carpal bones forward 294
Dislocation of clavicle 260

PAGE.
Dislocation of elbow joint..... 283
Dislocation of elbow joint, lateral..... 288
Dislocation, of fibula..... 837
Dislocation of fiubla, lower extremity..... 838
Dislocation of fibula, upper extremity..... 837
Dislocation of hip joint..... 300
Dislocation of hip joint, anomalous..... 321
Dislocation of hip joint backward and upward 302
Dislocation of hip joint backward and downward..... 311
Dislocation of hip joint forward and downward 314
Dislocation of hip joint forward and upward..... 317
Dislocation of hip joint, chronic and congenital..... 323
Dislocation of humerus..... 267
Dislocation of humerus backward..... 271
Dislocation of humerus downward..... 267
Dislocation of humerus forward..... 269
Dislocation of jaw..... 253
Dislocation of jaw, congenital. 257
Dislocation of patella..... 334
Dislocation of radius..... 290
Dislocation of radius backward 291
Dislocation of radius forward 290
Dislocation of radius outward 292
Dislocation of radio-ulnar joints..... 290
Dislocations of ribs..... 259
Dislocations of semi-lunar cartilages..... 331
Dislocation of shoulder joint.. 266
Dislocation of shoulder joint, anomalous..... 281
Dislocation of shoulder joint, complicated..... 280
Dislocation of ulna backward. 289
Dislocation of ulna, compound 289
Dislocation of ulna, lower extremity..... 295
Dislocation of ulna backward. 296
Dislocation of ulna forward... 296
Dislocation of vertebræ..... 257
Dislocation of wrist..... 292
Divisions of the hamstring tendons..... 740
Double ovariotomy..... 733
Dressing of stumps 809
Dropsy of joints..... 46
Dropsy of joints, etiology of... 60
PAGE.
Dropsy of joints, pathology of 61
Dropsy of joints, symptoms of. 60
Dropsy of joints, treatment.... 61
Dupuytren's method..... 784

E

Ectropion..... 515
Elbow, compound fracture of.. 42
Elbow joint, dislocation of.... 283
Elbow joint, resection of..... 754
Elbow joint, surgical anatomy of..... 786
Elephantiasis arabum..... 830
Elephantiasis græcorum..... 830
Elephantiasis scrotum..... 655
Elephantiasis, treatment of.... 831
Elongation of uvula..... 572
Emphysema of abdomen..... 175
Emphysema of the lung from wounds..... 666
Empyema..... 168–603
Encephalitis, acute..... 136
Encephalitis, chronic..... 136
Encephalitis, subacute..... 140
Encephalitis, traumatic..... 134
Encephalitis, chronic, diagnosis of..... 137
Encephalitis, chronic, pathology of..... 137
Encephalitis, chronic, treatment of..... 138
Encephalitis, subacute, treatment of..... 141
Encephalitis, traumatic, pathology of..... 135
Encephalitis, traumatic, symptoms of..... 136
Entrance of air into veins.... 839
Encysted hydrocele..... 649
Entropium..... 516
Epicanthius..... 516
Epithelioma 550
Epithelioma of the scrotum... 649
Epispadias 657
Epulis..... 565
Erectile tumors..... 550
Erysipelas following wounds of joints..... 89
Erysipelas of stump..... 813
Etiology of synovitis..... 47
Excision of anchylosed joints.. 79
Excision of head of femur for coxalgia..... 106
Excision of lower jaw..... 581
Excision of piles..... 690
Excision of upper jaw..... 580
Excision of tonsils..... 567
Excurvation of eyelids..... 522

PAGE.
Extirpation of eye ball..... 530
Extirpation of kidney..... 734
Extirpation of the ovaries ... 783
Extirpation of the spleen..... 785
Extirpation of the tongue, complete..... 562
Extraction of cataract..... 524
Extravasation of blood within the skull..... 150
Extravasation of blood within the skull, diagnosis of..... 151
Extravasation of blood within the skull, treatment of..... 152
Extroversion of the bladder.... 680
Exstrophy of the bladder..... 680
Exstrophy of the bladder, treatment of..... 682
Eyeball, contusions of..... 160
Eyeball, injuries of..... 159
Eyeball, injuries of and treatment of..... 161
Eyeball, wounds of..... 160

F

False anchylosis.....65– 70
False cartilages..... 80
False joints..... 368
Fatty tumors of tongue..... 564
Felon..... 118
Felon, etiology of..... 119
Felon, prognosis of..... 120
Felon, symptoms of..... 119
Felon, treatment of, constitutional..... 120
Felon, treatment of, surgical 123
Femur, fracture of 435
Femoral hernia..... 631
Fibula, dislocation of..... 337
Fibula, fracture of..... 480
Fingers, dislocation of..... 298
Fingers, fracture of..... 433
Fibro-muscular tumors of the uterus..... 728
Fistula in ano..... 695
Fistula in ano, causes of..... 695
Fistula in ano, diagnosis of.... 696
Fistula in ano, symptoms of... 695
Fistula in ano, varieties of.... 695
Fistula, penile..... 659
Fistula, perineal..... 658
Fistula, salivary..... 159
Fistula, scrotal..... 659
Fistula, thoracic..... 172
Fistula, urethral..... 658
Fistula, urinary, blind..... 659
Fissure of anus..... 694
Flap method of amputating.. 796
Foot, resection of tarsal bones 762
PAGE.
Foreign bodies in bladder.... 613
Foreign bodies in ear..... 542
Foreign bodies in eye..... 512
Foreign bodies in pharynx and œsophagus..... 595
Foreign bodies in rectum.... 614
Foreign bodies in stomach.... 609
Fractures, general considerations of..... 350
Fractures, causes of..... 352
Fractures, causes of, exciting.. 352
Fractures, causes of, predisposing..... 352
Fractures, callus, in process of repair..... 355
Fractures, callus, provisional.. 356
Fractures, compound..... 366
Fractures, compound, dangers in..... 366
Fractures, compound, definition of..... 366
Fractures, compound, treatment of..... 366
Fractures, etiology of..... 351
Fractures, false joints following 368
Fractures, non-union following 368
Fractures, physical symptoms of..... 353
Fractures, process of repair in 354
Fractures, prognosis in..... 353
Fractures, treatment of..... 356
Fractures, treatment of, apparatus in..... 357
Fractures, treatment of, apparatus in special..... 362
Fractures, treatment of, splints in..... 358
Fractures of acromion process 393
Fractures of ankle, compound 45
Fracture of the bones of the face..... 370
Fracture of the bones of the neck..... 378
Fracture of bones of the neck and trunk..... 382
Fracture of bones of the upper extremity..... 387
Fracture of bones of the leg... 470
Fracture of bones of the leg, symptoms of..... 470
Fracture of bones of the leg, prognosis of..... 471
Fracture of bones of the leg, treatment of..... 471
Fracture of the calcaneum..... 433
Fracture of the carpus..... 433
Fracture of condyles of femur. 463
Fracture of condyles, prognosis 463
Fracture of condyles, symptoms 463

PAGE.
Fracture of condyles, treatment 464
Fracture of clavicle..... 387
Fracture of clavicle, causes of.. 387
Fracture of clavicle, treatment 389
Fracture of coracoid process.. 395
Fracture of forearm... 411
Fracture of the forearm, both bones of..... 411
Fracture of forearm, symptoms 411
Fracture of forearm, prognosis 412
Fracture of forearm, treatment 412
Fracture of coronoid process.. 431
Fracture of femur..... 435
Fracture of femur, neck within the capsule..... 436
Fracture of femur, neck within the capsule, causes of..... 437
Fracture of femur, neck within capsule, symptoms of..... 437
Fracture of femur, neck within capsule, treatment of..... 441
Fracture of femur, neck without the capsule..... 444
Fracture of femur, neck without the capsule, diagnosis... 445
Fracture of femur, neck without the capsule, prognosis... 445
Fracture of femur, neck without the capsule, symptoms.. 444
Fracture of the femur, neck of, impacted..... 452
Fracture of the femur, neck of, symptoms of..... 452
Fracture of the femur, neck of, treatment of..... 452
Fracture of the great trochanter 458
Fracture of the great trochanter, symptoms of..... 458
Fracture of the great trochanter, treatment of..... 458
Fracture of femur, condyles of 463
Fracture of femur, condyles of, symptoms of 463
Fracture of femur, condyles of, prognosis of..... 463
Fracture of femur, condyles of, treatment of..... 464
Fracture of femur, condyles of, compound..... 464
Fracture of femur, shaft of.... 454
Fracture of the femur, shaft of, symptoms of..... 454
Fracture of the femur, shaft of, prognosis of..... 454
Fracture of the femur, shaft of, treatment of..... 455
Fracture of the fibula..... 480
Fracture of fibula, diagnosis... 480
Fracture of fibula, treatment.. 480
PAGE.
Fracture of the fingers..... 433
Fracture of the hand and fingers 433
Fracture of the humerus..... 399
Fracture of the humerus and anatomical neck..... 399
Fracture of humerus, condyles 408
Fracture of humerus, surgical neck of..... 401
Fracture of humerus, shaft of 406
Fracture of the humerus, treatment of..... 408
Fracture of humerus, within the capsule..... 400
Fracture of humerus, without the capsule..... 400
Fracture of inferior maxillary 374
Fracture of inferior maxillary, treatment of..... 375
Fracture of the lachrymal bones..... 372
Fracture of the malar bones 372
Fracture of the metacarpus 434
Fracture of the metacarpus, treatment of..... 434
Fracture of the metatarsus and phalanges..... 434
Fracture of the metatarsus and phalanges, treatment of.... 434
Fracture of the nasal bones 370
Fracture of the os hyoides.... 378
Fracture of olecranon process 426
Fracture of the patella..... 464
Fracture of the patella, symptoms of..... 465
Fracture of the patella, prognosis of..... 465
Fracture of the patella, treatment of..... 465
Fracture of the patella, compound..... 470
Fractures of the phalanges.... 435
Fracture of the phalanges, treatment of..... 435
Fracture of the radius, shaft of 413
Fracture of the radius, shaft of, treatment of..... 413
Fracture of the radius, inferior extremity 415
Fracture of the radius, inferior extremity, diagnosis of 416
Fracture of radius, superior extremity..... 414
Fracture of radius, superior extremity, treatment of..... 415
Fracture of the ribs..... 382
Fracture of the ribs, crepitation in..... 382
Fracture of the ribs, emphysema in..... 383

PAGE.
Fracture of ribs, treatment of 385
Fracture of scapula..... 393
Fracture of scapula, body of 393
Fracture of scapula, neck of 396
Fracture of the sternum..... 385
Fracture of superior maxillary 372
Fracture of the tarsus..... 482
Fracture of the tibia..... 481
Fracture of tibia, treatment of 482
Fracture of ulna..... 424
Fracture of ulna, symptoms of 425
Fracture of ulna, treatment of 425
Fracture of vertebral column 379
Fracture of the zygoma..... 373

G

Galvano-puncturefor aneurisms 215
Ganglion..... 114
Ganglion, treatment of..... 115
Gastrotomy..... 608
Genu-valgum..... 738
Genu-extrorsum..... 739
General considerations in resections..... 746
General rules for amputating 779
Great trochanter, fracture of 453

H

Hamilton's apparatus for fractured olecranon..... 421
Hand, resection of..... 756
Hand and fingers, fracture of.. 433
Harelip..... 553
Hæmothorax..... 603
Hæmatocele..... 650
Heart, wounds of..... 172
Heart, wounds of, symptoms of 173
Heart, wounds of, treatment of 173
Hemorrhage, arrest of..... 504
Hemorrhage, constitutional effects of..... 845
Hemorrhage, control of, after operations..... 503
Hemorrhage, periodic..... 846
Hemorrhage, prevention of.... 503
Hemorrhage from wounds of lung..... 166
Hemorrhagic diathesis..... 847
Hemorrhagic diathesis, treatment of..... 847
Hemorrhoids..... 685
Hemorrhoids, causes of 686
Hemorrhoidal flux..... 688
Hepatic abscess..... 735
Hernia, causes of..... 615
Hernia, definition of..... 615
Hernia, cerebri..... 149
Hernia, cerebri, treatment of.. 149
Hernia, crural..... 621
Hernia, femoral..... 621
Hernia, femoral, diagnosis of.. 622
Hernia, femoral, treatment of... 622
Hernia, inguinal..... 615
Hernia, inguinal, congenital.. 619
Hernia, inguinal, direct..... 619
Hernia, inguinal, diagnosis of. 620
Hernia, inguinal, oblique..... 618
Hernia, inguinal, treatment of. 621
Hernia, irreducible..... 629
Hernia, irreducible, causes of. 630
Hernia, irreducible, consequences of..... 630
Hernia,irreducible,treatment of 630
Hernia, irreducible,radical cure 630
Hernia of the lung.....171–605
Hernia, reducible..... 622
Hernia, reducible, treatment of 622
Hernia, reducible, treatment, palliative..... 624
Hernia, reducible, treatment, radical cure of..... 626
Hernia, strangulated, causes of 630
Hernia, strangulated, morbid appearances..... 632
Hernia, strangulated, symptoms of..... 631
Hernia, strangulated,treatment 632
Hernia, strangulated, varieties 632
Herniotomy..... ..638–644
Hip, compound fracture of..... 42
Hip disease..... 84
Hip joint, amputation at..... 794
Hip joint, dislocation of..... 300
Hip, resection of..... 757
History and general considerations of amputations..... 765
Housemaid's knee..... 116
Housemaid's knee, treatment of 117
Hodgen's apparatus for fractures..... 477
Humerus, dislocation of..... 267
Humerus, fracture of..... 399
Hydrarthrosis.....46– 60
Hydrops articuli..... 60
Hydrops pericardii..... 604
Hydrocele.....620–653
Hydrocele, congenital..... 653
Hydrocele of the cord.....620–649
Hydrothorax..... 603
Hypertrophy of clitoris..... 715
Hypertrophy of labia..... 714
Hypertrophy of the lips..... 550
Hypertrophy of scrotum..... 655
Hypertrophy of tendons..... 111
Hypertrophy of toe-nail..... 857
Hypodermic injection of atropine..... 54
Hypospadias..... 657

I

PAGE.

Indications for resections..... 747
Inferior maxillary fracture.... 874
Inflammation of the rectum... 698
Injuries of the abdomen..... 174
Injuries of the bladder..... 612
Injuries of the bursæ..... 837
Injuries of the eyeball..... 159
Injuries of the face..... 158
Injuries of the head..... 130
Injuries of the joints..... 25
Injuries of the lymphatics... 837
Injuries of the œsophagus..... 595
Injuries of the pelvis 180
Injuries of the rectum..... 614
Injuries of the spine..... 153
Injuries of the spine, pathology and treatment..... 154
Imperforate anus..... 698
Imperforate hymen..... 714
Imperforate nostril..... 560
Imperforate rectum..... 699
Imperforate vagina 714
Inguinal hernia..... 618
Inguinal hernia, congenital... 619
Inguinal hernia, diagnosis..... 620
Inguinal hernia, direct..... 619
Inguinal hernia, oblique..... 618
Inguinal hernia, operations for 637
Inguinal hernia, surgical anatomy of..... 634
Inguinal hernia, treatment of.. 621
Innominate artery, ligation of 231
Instruments required for amputation..... 770
Intestine, protrusion of..... 176
Iridectomy..... 528
Iridodesis..... 529
Introduction of stomach tube.. 597
Irreducible hernia..... 629
Irreducible hernia, radical cure 629
Irreducible hernia, treatment of 629
Inversion of the bladder..... 685

J

Jaw, dislocation of..... 253
Joints, anchylosed, excision of 79
Joints, complications of wounds 39
Joints, compound fracture of ankle..... 45
Joints, compound fracture of elbow..... 42
Joints, compound fracture of hip..... 43
Joints, compound fracture of knee..... 44
Joints, diseases of..... 25
Joints, dropsy of... .....46- 60
Joints, etiology..... 60
Joints, pathology of..... 61
Joints, symptoms of..... 60
Joints, treatment..... 61
Joints, erysipelas following the wounds of..... 39
Joints, pyemia following the wounds of..... 39
Joints, tetanus following the wounds of..... 39
Joints, treatment following the wounds of..... 39
Joints, injuries of 25
Joints, wounds of..... 37
Joints, wounds of, symptoms.. 38

K

Keloid..... 837
Knee, compound fracture of... 44
Knee, dislocation of..... 329
Knee, housemaid's..... 116
Knee, housemaid's, treatment of 117
Knee joint, amputation at.... 800
Knee joint, excision of..... 759
Knee joint, resection of..... 760
Knock-knee... 788

L

Laceration of muscles..... 106
Laceration of muscles, symptoms of..... 106
Laceration of muscles, treatment of..... 109
Laceration of the perineum.... 184
Laceration of the perineum, Baker Brown's operation for 186
Laceration of the perenium, prognosis of..... 184
Laceration of the perineum Sims's operation for..... 188
Laceration of the perineum, treatment..... 185
Laceration of the urethra..... 188
Laceration of urethra, treatment of..... 188
Lacerated perineum..... 706
Lagophthalmos..... 518
Lancing the gums..... 565
Larrey's method..... 783
Laryngotomy..... 590
Laryngo-tracheotomy..... 593
Larynx, tumors of..... 598
Larynx, wounds of..... 163
Larynx, polypi of..... 598
Larynx, warts of..... 598
Ligature of arteries..... 217
Ligature of common carotid arteries..... 223

PAGE.

Ligature of external carotid arteries..... 226
Ligature of facial arteries.... 227
Ligature of lingual arteries.... 226
Ligature of occipital arteries.. 227
Ligature of the superior thyroid arteries..... 226
Ligature of temporal arteries 227
Limb, substitute for..... ... 848
Lipoma..... 559
Lisfranc's operation..... 807
Lithotomy..... 670
Lithotomy, operation of..... 671
Lithotrity or crushing..... 676
Lung, hernia of..... 171
Lung, wounds of..... 165
Lung, wounds of, emphysema following..... 166
Lung, wounds of, empyema following..... 168
Lung, wounds of, hemorrhage following 166
Lung, wounds of, pneumonia following 168
Lung, wounds of, pneumothorax following..... 166
Lung, wounds of, symptoms of 165
Lung, wounds of, treatment, constitutional..... 170
Lung, wounds of, treatment, local..... 169
Lupus exedens..... 834
Lupus non-exedens..... 834
Luxations..... 243
Luxations, causes of..... 244
Luxations, complete..... 243
Luxations, compound..... 452
Ligation of abdominal aorta 233
Ligation of anterior tibial artery..... 240
Ligation of axillary artery.... 230
Ligation of brachial artery.... 231
Ligation of brachial artery in axilla..... 231
Ligation of the bracial artery below the clavicle..... 230
Ligation of circumflex iliac artery..... 237
Ligation of common iliac artery 233
Ligation of deep femoral artery..... 239
Ligation of epigastric artery.. 237
Ligation of external iliac artery..... 236
Ligation of femoral artery..... 238
Ligation of gluteal artery..... 235
Ligation of inferior thyroid artery..... 230
Ligation of internal iliac artery 235

PAGE.

Ligation of internal mammary artery..... 237
Ligation of lingual artery..... 562
Ligation of peroneal artery.. 242
Ligation of popliteal artery.... 239
Ligation of posterior tibial artery..... 241
Ligation of radial artery..... 232
Ligation of sciatic artery..... 236
Ligation of spermatic artery.. 646
Ligation of subclavian artery.. 227
Ligation of ulnar artery..... 232
Ligation of vertebral artery... 229
Ligature for aneurisms..... 213
Ligature for innominata artery 231
Luxations, complicated..... 243
Luxations, consecutive..... 243
Luxations, deformity from.... 246
Luxations, differential diagnosis... 247
Luxations, general symptoms of 245
Luxations, incomplete..... 243
Luxations, loss of function in 245
Luxations, old..... 244
Luxations, partial..... 243
Luxations, pathology of..... 248
Luxations, primitive..... 243
Luxations, prognosis of..... 248
Luxations, recent..... 244
Luxations, reduction of..... 249
Luxations, seat of..... 244
Luxations, simple..... 244
Luxations, treatment of..... 249
Luxations, varieties of..... 243
Lymphatics, injuries of..... 837
Lymphatics, varicose..... 834
Lymphangeitis..... 833

M

Maler bone, fracture of..... 878
Malformation of the auricle... 545
Malformation of the bladder... 680
Malformation of the urethra... 656
Malpositions of the bladder..... 680
Malignant affections of uterus. 720
Malignant affections of uterus, treatment of..... 720
Malignant stricture of rectum. 704
Malignant tumors of tongue.... 564
Marshall Hall's 'ready method' 589
Metacarpal bones, dislocation of 298
Metatarsal bones, amputation of..... 807
Metatarsal bones, dislocation of 347
Metatarsal bones, fracture of.. 484
Meningitis..... 861
Mixed or fusible calculus..... 663
Modes of amputating..... 774

PAGE.

Modified circular operation.... 778
Morbus coxarius..... 84
Mortality after amputations... 814
Movable cartilages..... 80
Movable cartilages, diagnosis of 82
Movable cartilages, etiology of 81
Movable cartilages, prognosis 82
Movable cartilages, symptoms 81
Movable cartilages, treatment 82
Muscle, laceration of..... 108
Muscle, rupture of..... 83
Myelitis..... 158

N

Nasal bones, fracture of..... 370
Nævus..... 822
Nævus, capillary..... 822
Nævus, cauterization for..... 823
Nævus, exsection for..... 824
Nævus, injection for..... 823
Nævus, ligation for..... 824
Nævus, operations for..... 822
Nævus, vaccination for..... 823
Nævus, venous..... 822
Necrosis of jaws..... 573
Neck, wounds of..... 162
Neck, wounds of, treatment of 163
Neck of femur, fractures of.... 436
Needle, aneurismal (plate of).. 219
Nelaton's splint for fracture of the radius..... 414
Nephrotomy for renal calculus 234
Neuroma of stump..... 813
Nonmalignant tumors of rectum 705

O

Occlusion of the anus, complete and partial..... 698
Occlusion of the rectum 699
Occlusion of urethra, complete 657
Occlusion of urethra, partial.. 656
Œsophagotomy..... 596
Olecranon process, fracture of 226
Onychia..... 125
Openings of abscesses and sinuses..... 827
Operative surgery..... 486
Operations, surgical..... 486
Operations, surgical, anæsthesia in..... 501
Operations, surgical, appliances for..... 500
Operations, surgical, arrest of hemorrhage after..... 504
Operations, surgical, causes of death after 493
Operations, surgical, closure of wounds..... 503

PAGE.

Operations, surgical, circumstances influencing results.. 489
Operations, surgical, control of hemorrhage after..... 503
Operations, surgical, consent of patient to..... 496
Operations, surgical, how performed..... 499
Operations, surgical, preparation of patients for..... 496
Operations, surgical, prevention of hemorrhage in..... 503
Operations, surgical, temerature of room during..... 500
Operations on the abdomen... 605
Operations on the anus..... 685
Operations for cataract..... 524
Operations on conjunctiva.... 521
Operations for depressed nose 792
Operations for the disarticulation of the fingers..... 549
Operations on the ear..... 542
Operations on the eyeball..... 524
Operations on the eyelids..... 513
Operations on the eye and appendages..... 511
Operations on the face, plastic 546
Operations on female generative organs..... 706
Operations for femoral hernia 642
Operations on head and neck.. 503
Operations on the jaws..... 573
Operations for inguinal hernia 637
Operations on the lachrymal apparatus..... 519
Operations on the lips..... 550
Operations on the neck..... 583
Operations on the scrotum and penis..... 646
Operations on the muscles.... 522
Operations on the tongue..... 560
Operations on the thorax..... 609
Operations for urinary vaginal fistula..... 709
Operations within the mouth.. 565
Operations within the nasal cavity..... 556
Operation for amputation of the breast..... 800
Operation for amputation at the elbow..... 786
Operation for amputation of the metacarpus..... 790
Operation for amputation of the penis 655
Operation for amputation at the shoulder..... 783
Operation for amputation at the wrist..... 790

PAGE.

Operation for castration..... 643
Operation of colotomy..... 645
Operation for cure of artificial anus..... 610
Operation for empyema..... 603
Operation for fissure of anus.. 694
Operation for fistula in ano... 697
Operation of gastrotomy..... 606
Operation for hæmothorax.... 603
Operation for hydrothorax.... 603
Operation for hydrocele..... 654
Operation for hypertrophy of the scrotum..... 656
Operation for ligation of piles. 690
Operation of lithotomy..... 671
Operation of lithotomy, bilateral method..... 674
Operation of lithotomy, median method..... 675
Operation of lithotomy, suprapubic method..... 676
Operation of lithotrity..... 678
Operation of ovariotomy..... 727
Operation of paracentesis abdominis..... 607
Operation of pneumothorax... 602
Operation for the radical cure of hernia..... 641
Operation for radical cure of femoral hernia..... 644
Operation of resection..... 750
Operation of resection of elbow 754
Operation of resection of hip.. 757
Operation of resection of knee joint..... 760
Operation for staphyloraphy.. 569
Operation for varicocele..... 647
Ophthalmoscope..... 534
Orthopædic surgery..... 736
Os hyoides, fracture of..... 378
Osteitis and osteo-myelitis of stumps..... 814
Outward bowing of the knee.. 789
Oval method of amputating... 778
Ovarian tumors..... 721
Ovarian tumors, differential diagnosis of..... 723
Ovariotomy..... 725
Oxalate of lime calculus..... 662

P

Patella, dislocation of..... 434
Patella, fracture of..... 464
Patella, fracture, compound of 470
Paracentesis abdominis..... 607
Paracentesis capitis..... 511
Paracentesis thoracis..... 603
Partial occlusion of the anus.. 698

PAGE.

Partial occlusion of the urethra 656
Pelvis, injuries of..... 189
Penetrating wounds of thorax 705
Penis, amputation of..... 655
Perineal fistula..... 695
Perinephritic abscess..... 736
Perineum lacerated..... 706
Perineum, laceration of..... 184
Perineum, laceration of, treatment..... 185
Periostitis of stump..... 814
Penile fistula..... 659
Peritonitis, traumatic..... 179
Phosphatic calculus..... 662
Piles..... 685
Piles, external..... 686
Piles, internal.....687-690
Pirogoff's amputation..... 805
Polypi of uterus..... 719
Polypus of ear..... 543
Polypus of larynx..... 598
Polypus of nose..... 550
Plastic operations on face..... 546
Plugging the posterior nares.. 558
Pneumocele..... 171
Pneumothorax.....602-166
Pneumonia following wounded lung..... 168
Pneumonia traumatic..... 168
Preparation of patients for surgical operations..... 496
Pressure for aneurisms....205-206
Probing of the nasal duct..... 558
Probing of the puncta and canaliculi..... 519
Process of repair after resection..... 748
Prolapsus ani..... 696
Prolapsus of the iris..... 532
Prolapsus of the rectum..... 668
Prolapsus of the vagina..... 716
Protrusion of the eyeball.. ... 531
Protrusion of intestine..... 176
Psoas abscess... 699
Pterygium..... 531
Ptosis..... 518
Pyemia following wounds of joints..... 89

R

Radical cure of hernia..... 636
Radius, dislocation of 399
Radius, fracture of..... 413
Radius, fracture of superior extremity 414
Radius, fracture of inferior extremity 415
Rectal polypus..... 705

PAGE.
Recto vesical and recto urethral fistulæ..... 699
Reducible hernia..... 628
Removal of the clitoris..... 715
Removal of two-thirds of lower jaw..... 583
Removal of the parotid gland 574
Removal of tongue..... 560
Renal calculus..... 663
Resections of joints and bones 746
Resection of ankle..... 761
Resection of astragalus..... 762
Resection of bones of the leg.. 761
Resection of elbow..... 754
Resection of femur in its continuity..... 759
Resection of hand..... 756
Resection of hip..... 757
Resection of humerus..... 754
Resection of joints of the lower extremity..... 756
Resection of joints of the upper extremity..... 752
Resection of knee joint..... 760
Resection of shoulder joint.... 752
Resection of wrist joint..... 755
Resection of upper maxillary bone..... 575
Resection in the continuity of bones..... 763
Ribs, dislocation of..... 259
Ribs, fracture of..... 382
Rodent ulcer..... 836
Rules for ligating arteries..... 217
Rupture of muscles..... 33
Rupture of tendons..... 110
Rupture of tendons, symptoms 110
Rupture of tendons, treatment 110

S

Salivary fistula.....575–159
Scalp, contusion of..... 143
Scalp, injuries of..... 143
Scalp, treatment of..... 144
Scalp, wounds of..... 144
Scalp, wounds of, treatment of 144
Scapula, excision of..... 750
Scapula, fracture of..... 398
Scrotal fistula..... 659
Section of the frænum..... 654
Semi-lunar cartilages, dislocations of..... 331
Shoulder, dislocation of..... 266
Simple or fibrous stricture.... 700
Simple or fibrous stricture, symptoms of..... 700
Simple or fibrous stricture, diagnosis of..... 701
PAGE.
Simple or fibrous stricture, treatment of..... 702
Sessile growths..... 705
Sims's operation for lacerated perineum..... 183
Sinuses, opening of..... 337
Skull, extravasation of blood within..... 150
Sounding for stone..... 668
Solid tumors..... 725
Special excisions..... 750
Sprains, description of..... 25
Sprains, diagnosis of..... 25
Sprains, etiology of..... 26
Sprains, mechanical, treatment 34
Sprains, predisposing causes of 26
Sprains, seat of..... 26
Sprains, severe..... 27
Sprains, Sayre's treatment of 35
Sprains, symptoms of..... 27
Sprains, treatment of..... 29
Spine, concussion of..... 153
Spine, compression of..... 153
Spine, inflammation of.....153–153
Spine, injuries of..... 153
Spine, treatment of..... 155
Spine, wounds of..... 155
Spine, wounds of, treatment of 157
Spinal concussion..... 381
Spinal meningitis..... 381
Spermatocele..... 649
Splenic abscess..... 735
Splints, for fracture of forearm 413
Splints, Dupuytren's, for fibula 481
Splints, Hodge's..... 457
Splints, Hodgen's.....476–460
Splints, Neill's..... 472
Splints, Nelaton's..... 414
Splints, Clark's suspension.... 447
Splints, O'Reilly's..... 467
Splints, Smith's anterior..... 459
Sternum, fracture of..... 385
Staphyloma..... 530
Staphyloraphy..... 567
Strabismus..... 522
Stricture of the rectum..... 700
Strangulated hernia..... 630
Strangulated hernia, causes of 630
Strangulated hernia, seat of stricture..... 630
Strangulated hernia, symptoms of..... 631
Strangulated hernia, taxis in 633
Strangulated hernia, treatment of 633
Strangulated hernia, varieties of..... 633
Stone in female bladder..... 679
Stump, affections of..... 813

PAGE.
Stump, aneurism of..... 813
Stump, dressing of..... 809
Stump, erysipelas of..... 813
Stump, neuroma of..... 813
Stump, osteitis of..... 814
Stump osteo-myelitis..... 813
Stump, periostitis of 814
Stump, secondary hemorrhage 813
Stump, structure of..... 811
Structure of vesical calculi..... 664
Sub-luxation of jaw..... 256
Sub-periosteal resection..... 764
Sub-astragaloid amputation... 805
Substitute for natural limb.... 848
Suction, removing cataract by 528
Surgical anatomy of inguinal hernia..... 634
Surgical anatomy of femoral hernia..... 648
Surgical anatomy of colotomy 645
Surgical anatomy of lithotomy 676
Surgical anatomy of elbow joint 780
Surgical anatomy, hip joint 757- 796
Surgical anatomy, knee joint.. 801
Surgical anatomy of shoulder joint..... 782
Surgical anatomy of wrist joint 789
Superior maxillary, fracture of 372
Syme's operation on the foot 807
Synovitis..... 46
Synovitis, etiology of..... 47
Synovitis, rheumatic..... 47
Synovitis, scrofulous..... 48
Synovitis, symptoms of..... 47
Synovitis, terminations of..... 48
Synovitis, treatment of..... 48
Synovitis, treatment, local.... 53

T

Table of mortality after amputations..... 816
Talipes calcaneus..... 744
Talipes equinus..... 741
Talipes varus..... 742
Talipes valgus..... 745
Talipes, treatment of, without tenotomy..... 745
Tapping the pleural cavity.... 602
Tarsus, dislocations of..... 847
Tarsus, fractures of..... 482
Tetanus, following wounds.... 89
Tetanus, traumatic.... ... 89
Teale's method of amputation 778
Tendons, dislocation of..... 111
Tendons, hypertrophy of..... 111
Tendons, rupture of..... 110
Tendons, symptoms of..... 110
Tendons, treatment of..... 110
The ophthalmoscope..... 534
PAGE.
The retina..... 539
Thigh, amputations of..... 798
Thumb, dislocation of..... 296
Tibia, fractures of..... 481
Thoracic fistula..... 172
Temperature of room for operation..... 500
Toes, amputation of..... 809
Toes, dislocations of..... 348
Toe nail, hypertrophy of..... 897
Toe nail, inverted..... 128
Toe nail ulcer..... 125
Toe nail ulcer, prognosis of.... 125
Toe nail ulcer, treatment of.... 126
Toe nail ulcer, treatment of, palliative..... 126
Toe nail ulcer, treatment of, radical..... 126
Tongue, wounds of..... 160
Tongue tie..... 563
Torticollis..... 605
Tourniquet in amputations... 770
Transfusion of blood..... 829
Tracheotomy..... 591
Trephining..... 508
Traumatic arthritis..... 38
Traumatic peritonitis..... 179
Traumatic pneumonia..... 168
Traumatic tetanus..... 89
Trachea, wounds of..... 161
Trichiasis..... 517
Trochanter, great, fracture of 458
Truss, in hernia..... 624
Tumors of the auricle..... 543
Tumors of the lips..... 550
Tumors of the meatus..... 543
Tumors of the orbit..... 531
Tumors of the lower jaw..... 581
Tumors of the testis..... 652
Tumors of the tongue..... 563
Tumors of the retina..... 719
Tumors, of various kinds..... 715
Tumors, warts, or polypi of the larynx..... 598

U

Ulna, dislocations of..... 289
Ulna, fracture of..... 424
Uranoplasty..... 571
Urates in the urine..... 661
Urethra, laceration of..... 183
Urethra, treatment of..... 183
Urethra, malformation of.... 656
Urethral fistula..... 658
Urethroplasty..... 659
Uric acid calculus..... 661
Urinary calculus..... 661
Urinary fistula, blind..... 659
Ulcer, rodent..... 886

V

PAGE.

Vaccination..... 826
Vaginismus..... 720
Varicocele.....646–620
Varicose veins..... 825
Varicose veins, operation for.. 825
Varicose lymphatics..... 834
Varix of the femoral vein..... 623
Veins, entrance of air into..... 839
Veins, hemorrhage from..... 838
Veins, injuries of..... 838
Veins, treatment for air entering into..... 839
Vertebræ, dislocation of..... 257
Vertebræ, fracture of..... 349
Vesical calculus..... 664
Vesical calculus, symptoms of 667
Vesical calculus, treatment of. 667
Vesical calculus, diagnosis of.. 668
Vesical calculus, prognosis of. 668
Vesical calculus, sounding for. 669
Vesical calculus, instruments required for..... 671
Vesical calculus, crushing of... 676
Vesical calculus, urethra snare for removing..... 678
Vesical calculus, in women.... 679

W

Warts, tumors, or polypi of the larynx..... 598
Warty stricture of the rectum. 704
Weak ankles..... 745
Whitlow..... 118
Whitlow, etiology of..... 119
Whitlow, prognosis of..... 120
Whitlow, symptoms of..... 119
Whitlow, treatment of, constitutional..... 120
Whitlow, treatment of, surgical 123
White swelling..... 65
White swelling, description of. 65
White swelling, false anchylosis in..... 65
White swelling, prognosis of.. 66
White swelling, symptoms of.. 66
White swelling, treatment of... 67
Wounds of abdomen, penetrating..... 176
Wounds of abdomen, non-penetrating..... 175
Wounds of abdomen, treatment of..... 178
Wounds of air passages..... 162
Wounds of bladder.....180–618
Wounds of bladder, symptoms 181
Wounds of bladder, treatment of.....618–182
Wounds of brain and its membranes..... 146
Wounds of brain and its membranes, symptoms of..... 146
Wounds of brain and its membranes, treatment of..... 148
Wounds of chest..... 165
Wounds of chest, non-penetrating..... 165
Wounds of eyeball..... 160
Wounds of heart..... 172
Wounds of heart, symptoms of 173
Wounds of heart, treatment of 173
Wounds of joints..... 37
Wounds of joints, complications of..... 39
Wounds of lung..... 165
Wounds of lung, constitutional treatment..... 170
Wounds of lung, local treatment..... 169
Wounds of lung, symptoms of. 165
Wounds of neck..... 162
Wounds of neck, treatment of. 163
Wounds of tongue..... 564
Wrist, dislocation of..... 293
Wrist joint, surgical anatomy 789
Wry neck..... 605

Z

Zygoma, fracture of..... 373